Environmental News and Noise in Financial Markets:

Event Studies Concerning the Effect of Environmental Performance on Financial Performance

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Abstract

Corporate social responsibility (CSR) describes the idea that businesses should be held accountable for the social and environmental consequences of their business activity. In addition to the potential ethical reasons for firms to embrace CSR, firms may decide to be more socially responsible in order to improve their image and reputation, boost their bottom line, or attract the capital of socially responsible investors. In this paper, I conduct several event studies to examine the impact of third-party recognition of good and bad CSR performance on firms' market values, with a particular focus on the environment. Evidence from the event studies is mixed. Being added to the FTSE4Good Global Index does not appear to impact returns; however, deletion from the index is associated with a statistically significant decline in market value. One set of "green rankings" does not appear to have an impact on firms' market performance, but recognition of top carbon abatement performance by the other set of rankings is associated with negative abnormal returns. While the EPA Climate Leadership Awards do not appear to impact firms market value, recognition as an industry leader in the RobecoSAM Yearbook results in strongly significant positive abnormal returns. A meta-analysis of the results shows that aggregated news that is positive from a CSR perspective is not significant, but that aggregated negative news is significant. When positive and negative news are combined, there is a significant effect on some time intervals.

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1 Introduction

Corporate social responsibility (CSR) describes the idea that businesses should be held accountable for the social and environmental consequences of their business activity. In addition to the potential ethical reasons for firms to embrace CSR, firms may decide to be more socially responsible in order to improve their image, to earn "green profits", or to attract the capital of socially responsible investors. While it is obvious that socially responsible investors react positively to CSR performance, the effect of CSR performance on the investment decisions of traditional investors is not as clear.

According to the common view encapsulated in the Gordon Growth Model, the price of a stock should be equal to the present value of expected future dividend payments (Gordon, 1959). On this view, traditional investors should only consider social responsibility insofar it impacts dividend expectations, that is, when CSR is used as a competitive strategy. For example, CSR might be expected to decrease legal/compliance costs, increase operational efficiency, drive sales as a form advertising, or grant firms a first-mover advantage on the expectation of future CSR-inspired legal regulations (Esty, 2009). CSR could result in lower stock prices if socially responsible measures are seen as a waste of capital that could otherwise be distributed to shareholders. It is also possible that traditional investors do not see CSR as having any net effect on dividend expectations.

However, the Gordon Growth Model does not take into account all relevant factors that might influence a firm's stock price. As of the start of 2014 in the U.S. around $6.57 trillion was invested in strategies that considered environmental, social and corporate governance factors. This represents roughly 18% of all assets under management in the U.S. (Sustainable Investment Forum, 2014). While it is likely that a sizable portion of these socially responsible investors are motivated by the same factors as traditional investors, it is also likely that many value the social impact of a firm beyond its influence on dividend expectations. Given the large amount of capital invested in CSR strategies, traditional investors may act in anticipation of market movement by socially responsible investors. For example, if a company is recognized for excellence in carbon abatement, traditional investors may bid up the share price, not because dividend expectations increased, but because they expect socially responsible investors to purchase the stock.

In this paper, I evaluate the effect of corporate social responsibility on firms' market values, with a particular focus on environmental responsibility. Because stock prices should move stochastically except when new information is obtained by the market, I measure the effect of CSR through movements in share prices following third-party recognition of good and bad CSR performance. Using over twenty event studies, I analyze the impact of three related categories of CSR information. First, I evaluate whether addition to or deletion from the FTSE4Good Global Index for socially responsible investors constitutes "news" to the market. Second, I conduct a series of event studies to measure the effects of two prominent rankings of corporate environmental performance: the Newsweek Green Rankings and the Carbon Disclosure Project's S&P 500 Report. Third, I measure the effect of receiving awards for environmental performance by conducting an event study on the firms recognized by the EPA Climate Leadership Awards and the RobecoSAM Sustainability Yearbook.

All three categories provide two potential kinds of "news" about CSR performance to the financial markets. First, inclusion in an index, achieving a high ranking, or recognition with an award might provide information about actual performance. Even mere aggregation of publicly available information could constitute a new signal if already-available information reaches investors because of newfound accessibility. Second, all three categories could

themselves constitute new information for the market if recognition with index inclusion, a high ranking, or an award constitutes a shock to the company's reputation.

Evidence from the event studies is mixed. Being added to the FTSE4Good Global Index does not appear to impact returns; however, deletion from the index is associated with a statistically significant decline in market value. The Newsweek Green Rankings do not appear to have an impact on firms' market performance, with the exception of a weakly significant association between better rankings and better abnormal returns on the day the report is released. Recognition of top carbon abatement performance by the Carbon Disclosure Project is associated with negative returns, as is non-disclosure of carbon performance, but bottom ranked performance, changes in disclosure score, and changes in performance do not appear to have an effect. While the EPA Climate Leadership Awards do not appear to impact firms market value, recognition as an industry leader in the RobecoSAM Yearbook results in strongly significant positive abnormal returns.

Across the event studies, signals of positive environmental performance are not always associated with positive financial performance. Of the two positive environmental signals that reported a statistically significant result, one reported negative abnormal returns (CDP A List) and one reported positive abnormal returns (RobecoSAM Leaders). Because the former focuses on carbon emissions reductions and the latter is primarily concerned with environmental business risks and opportunities, the two results are not contradictory if the market tends to view excellence in carbon abatement as a waste, but still values mitigation of other environmental factors that are more likely to constitute business, legal, or reputation risks. The event studies on signals of negative environmental performance provide more unified evidence in that wherever they are significant, they result in negative abnormal returns.

A meta-analysis of results shows that aggregated positive news is not significant, but that aggregated negative news is significant on the event date and early in the post-event window. When all news is considered, there is a weakly significant effect during the early post-event window, but the assumption of a homoskedastic distribution of effect sizes is rejected. This provides further evidence that the market does not treat positive and negative signals of environmental performance symmetrically.

2 The Basic Model

Throughout this paper, I use an event study methodology to measure the effect of new information on firms' stock prices. The methodology is based on that developed by Fama, Fisher, Jensen, and Roll (1969), updated by Brown and Warner (1980) and analyzed by MacKinlay (1997).

Event studies are able to measure the effects of an "event" on firms' share prices. Event studies have been used to measure the effects of various corporate finance events (e.g. stock splits, mergers and acquisitions, dividend declarations) as well as the release of new macroeconomic information. While long-horizon event studies exist, the methodology is most accurate when events occur at a discrete time, are unanticipated, and have quickly realized effects. Although the efficient markets hypothesis postulates that new information will immediately be incorporated into share prices, it is realistic to expect the effect to begin or persist for a few days after the event. Information from an event may take time to spread to investors, who may not reevaluate their investments immediately.

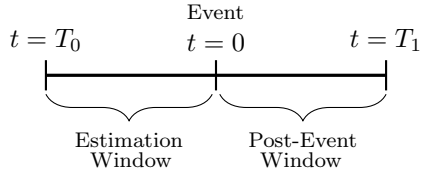
In order to measure the effect of new information, event studies examine the observed

periodic returns of a stock and predict what the returns of the stock would have been if the event had not occurred. The object of interest in an event study is the difference between observed and predicted returns (abnormal returns). In this section, I explain how I estimate and analyze these abnormal returns.

For each event study, I assemble a data set of event observations. Each event observation consists of a firm-date pair. For example, in an event study concerning the impact of stock splits on share price, the data set would consist of event observations where each observation matches the firm whose stock was split with the date of the split. In some of the event studies considered in this paper, a single event will result in multiple event observations. This occurs whenever the event affects several firms. For example, in the study concerning inclusion in the FTSE4Good socially responsible index, many firms were added to the index at once, so the semi-annual announcement of inclusion (the event) results in one event observation per firm added to the index.

For each event observation, stock prices are collected for the time surrounding the event. These stock prices are adjusted for splits and dividends so that those events do not impact estimation or abnormal returns. Firms that experienced other corporate financial events (e.g. M&A) or were delisted during the event study time horizon are excluded from the sample, as is standard in the event study literature. Under the assumption that these corporate financial events are unrelated to the event, inclusion would bias results. Given the small size of the effects observed in this paper's event studies, this assumption is warranted. For most of the event studies in this paper, no firms were excluded. Adjusted stock prices are converted into periodic returns in order to be comparable across firms. In this essay, I use daily returns because small effects would be overwhelmed by noise or other catalysts if weekly or monthly returns were used instead.

The time before the event is known as the estimation window because returns from this window are used to derive an estimate of the normal returns that would have been observed in the post-event window if the event had not taken place. Following standard practice, the estimation window is 120 days long to provide a sufficient number of observations with which to estimate counter-factual returns in the post-event period. The estimation window does not include the event date or the post-event period so that the event does not influence the normal performance parameter estimates. The post-event window is set to 20 trading days (including the day of the event) so that persistence of abnormal returns following the event may be analyzed. The post-event window is not longer because the chance of a non-event catalyst impacting abnormal returns increases with the length of the window. Abnormal returns later in the post-event window should be considered cautiously. Once returns are collected for each event observation, the event observations are collapsed into a single timeline where the event occurs at $t = 0$, the start of the estimation window is $T_0 = -120$, and the end of the post-event window is $T_1 = 19$.



I use a market model to estimate a firm's normal daily returns based on the its relationship with the market. Normal daily returns are estimated with ordinary least squares over

the estimation window for each firm:

$$R_{it} = \beta_0 + \beta_1 R_{mt} + \epsilon_{it}$$

where R_{it} is the return of the firm i on day t and R_{mt} is the return of the market for time t. Equity returns are assumed to be distributed jointly multivariate normal and independently and identically over time, which is consistent with the random walk hypothesis (Cootner, 1964; Fama, 1965; Malkiel, 1973). Under these assumptions OLS is efficient. I use the S&P 500 Index of the 500 largest firms on the NYSE or NASDAQ as a proxy for market returns. Given the large size of all firms included in this event study, the risk of biasing results due to large-cap risk discounting is negligible.

In the post-event window, an estimate of abnormal returns is determined for each firm at each time according to the difference between observed returns and estimated normal returns:

$$\hat{\mathrm{AR}}_{it} = R_{it} - (\hat{\beta}_0 + \hat{\beta}_1 R_{mt})$$

Under the null hypothesis, abnormal returns will be normally distributed with mean zero and variance equal to the sample variance of the error term from the market return model:

$$\sigma^2(\hat{\mathrm{AR}}_{it}) = \sigma^2(\epsilon_{it})$$

The event window is large enough that variance resulting from sampling error on β_0 and β_1 is assumed to be zero. The use of the error term's sample variance as the variance of abnormal returns is consistent with the view that abnormal returns have the same properties as normal returns during the estimation widow under the null hypothesis. According to the efficient markets hypothesis, the value of β_0 would be zero (i.e. firms would not consistently generate active returns). This is observed across the events, but the term is still included for completeness.

The null hypothesis that the true value of the abnormal return for firm i at day t is zero can be tested with the following t-stat:

$$t_{\mathrm{AR}_{it}} = \frac{\hat{\mathrm{AR}}_{it}}{\sigma(\hat{\mathrm{AR}}_{it})}$$

For an event study with a single event observation, the firm's abnormal returns would be cumulatively summed across the post-event window to determine the cumulative abnormal returns for the firm up to time T:

$$\hat{\mathrm{CAR}}_{it} = \sum_{t=0}^{T} \hat{\mathrm{AR}}_{it}$$

$$\sigma^2(\hat{\mathrm{CAR}}_{it}) = \sigma^2(\hat{\mathrm{AR}}_{it})(T+1)$$

Thus:

$$\hat{\mathrm{AR}}_{it} \sim N(0, \sigma^2(\hat{\mathrm{AR}}_{it}))$$

$$\hat{\mathrm{CAR}}_{it} \sim N(0, \sigma^2(\hat{\mathrm{CAR}}_{it}))$$

The null hypothesis that the true value of a firm's cumulative abnormal return up to a given time in the post-event window is zero can be tested with the following test statistic:

$$t_{\mathrm{CAR}_{it}} = \frac{\hat{\mathrm{CAR}}_{it}}{\sigma(\hat{\mathrm{CAR}}_{it})}$$

For the event studies in this essay, abnormal returns are aggregated across the entire sample of n event observations to create a time series of average abnormal returns $\hat{\text{AAR}}$:

$$\hat{\text{AAR}}_t = \frac{1}{n}\sum_{i=1}^{n}\hat{\text{AR}}_{it}$$

with variance:

$$\sigma^2(\hat{\text{AAR}}_t) = \frac{1}{n^2}\sum_{i=1}^{n}\sigma^2(\hat{\text{AR}}_{it})$$

The null hypothesis that the true value of the average abnormal returns at time t across all event observations is zero can be tested with the following t-stat:

$$t_{\text{AAR}_t} = \frac{\hat{\text{AAR}}_t}{\sigma(\hat{\text{AAR}}_t)}$$

Average abnormal returns are then aggregated across the post-event window to calculate the cumulative average abnormal returns up to time T:

$$\hat{\text{CAAR}}_t = \sum_{t=0}^{T}\hat{\text{AAR}}_t$$

with variance:

$$\sigma^2(\hat{\text{CAAR}}_t) = \sigma^2(\hat{\text{AAR}}_t)(T+1)$$

With this estimate and variance, the null hypothesis that the true value of the cumulative average abnormal returns is zero can be tested:

$$t_{\text{CAAR}_t} = \frac{\hat{\text{CAAR}}_t}{\sigma(\hat{\text{CAAR}}_t)}$$

For each event study, I will present cumulative average abnormal returns and its test statistic at each trading day in the post-event window. At t_0, CAAR and its test statistic are equivalent to AAR_0 and t_{AAR_0}, respectively.

For each event study, I also analyze the estimated abnormal returns with OLS. This methodology is not standard in the event study literature, but should serve as an indicator of the persistence of non-cumulative abnormal returns throughout the post-event period. Because the dependent variable in these regressions is itself an estimate, the effect of the event on actual abnormal returns is not measured with this regression. Instead, it describes how estimated abnormal returns vary across the post-event window. This information is useful because abnormal returns later in the window are more likely to be unrelated to the actual event. I use the following two model specifications:

$$(1) \quad \hat{\text{AR}}_{it} = \hat{\beta}_0 + \hat{\beta}_1 d_{t\geq 0} + \hat{\epsilon}_{it}$$

$$(2) \quad \hat{\text{AR}}_{it} = \hat{\beta}_0 + \hat{\beta}_1 d_{t=0} + \hat{\beta}_2 d_{0<t\leq 5} + \hat{\beta}_3 d_{5<t} + \hat{\epsilon}_{it}$$

In the first specification, the effect of the event on estimated abnormal returns is estimated using a dummy variable that is 0 during the estimation window and 1 from t_0 through T_1 (i.e. the post-event window including the event). Unlike the CAAR method described above, this model considers each abnormal return as an independent observation. Thus,

t_{CAAR} at T_1 is not the same as the test statistic on this dummy variable. Because the dependent variable is an estimate from another model, results from these regressions should be interpreted as a decomposition of that estimate over time.

In the second specification, the post-event window is further divided using three dummy variables. The first ($d_{t=0}$) is 0 at all times except the day of the event (t_0). The test statistic on this dummy variable is identical to t_{CAAR} at t_0 because at that time AAR = CAAR. A second dummy variable ($d_{0<t\leq 5}$) examines the effect of the event on abnormal returns during the first five trading days after the day of the event. Although the efficient markets hypothesis postulates that new information is immediately incorporated into firms' share prices, in reality one might expect delays as the information spreads to investors and as investors take time to reevaluate their investment decisions. The third dummy variable ($d_{5<t}$) captures the effect of the event late in the post-event window. Effects reported through this dummy variable should be considered cautiously because longer time horizons introduce an increased possibility of abnormal returns unrelated to the event itself.

2.1 Proof of concept: BP and the Deepwater Horizon Disaster

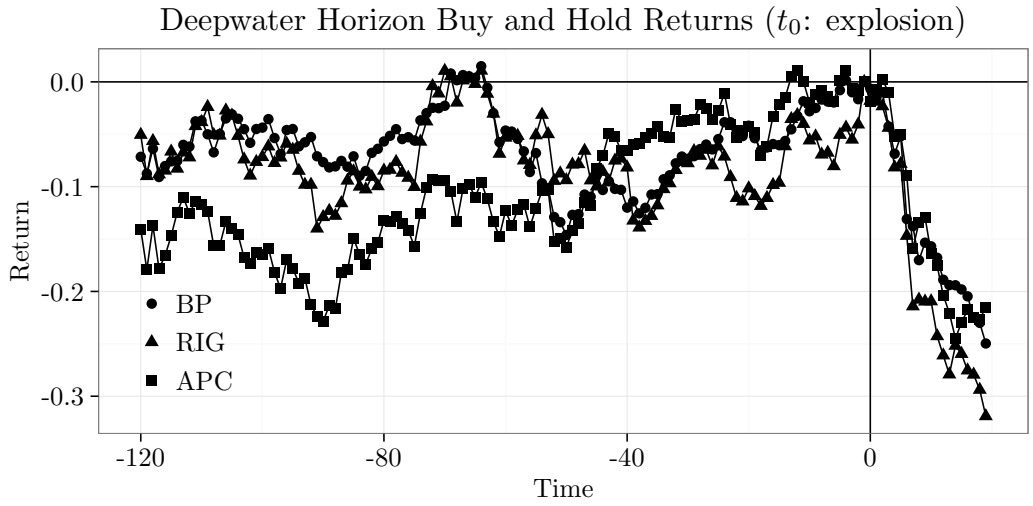
Before presenting the results of the CSR event studies (many of which contain small or insignificant effects), I show that the model works by presenting an event study that confirms an obvious result. Following the Deepwater Horizon disaster (the 2010 oil spill in the Gulf of Mexico), the firms involved in the disaster were faced with immense clean-up costs, fines, and negative shocks to their reputations. As a result, BP, Anadarko, and Transocean—the three firms most directly involved in the disaster—suffered negative abnormal returns. During the twenty days following the disaster, BP's market capitalization decreased by around \$47.3B (−25%), Anadarko's by \$16.2B (−22%), and Transocean's by \$9.4B (−32%). As of July 2015, BP has been ordered to pay nearly \$54B in legal and cleanup costs, which is similar in magnitude to the decline in market value.[1]

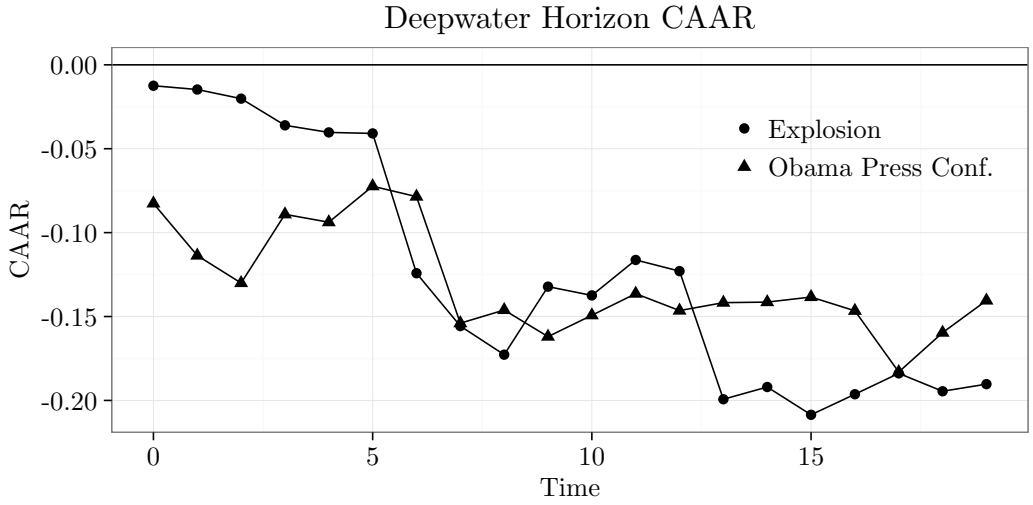
On April 20th, 2010, the Deepwater Horizon oil rig exploded following a wellhead blowout. The rig was operated by Transocean and primarily owned by BP, with Anadarko owning a 25% stake. Two days later, the rig sank. Over the next several days, the extent of the environmental damages were slowly realized, and on April 28th the NOAA re-estimated the rate of the leak at five times BP's estimate. On April 29th, President Obama made his first comments on the disaster, publicly lambasting the well operators. Given this timeline of events, an event study should recognize abnormal returns following the initial wellhead explosion. The event study should also recognize negative abnormal returns throughout the post-event window following new information about the extent of the damages. A large effect on the day of Obama's press conference should be expected because it involved a major attack on the firms' reputations.[2]

I begin by performing an event study in which the event date is April 21st, 2010. This date is selected because the wellhead blowout took place after trading hours on April 20th. The results confirm the expectation that the responsible firms would see negative abnormal returns on the day of the blowout and throughout the post-event window, with a particularly large drop on the day of Obama's statements. Although these cumulative average abnormal returns are larger in magnitude than those observed in the CSR event studies, there is only weak significance until $t = 3$ due to the small number of event observations ($n = 3$).

[1] Gilbert, Daniel, and Kent, Sarah. (2015). "BP Agrees to Pay \$18.7 Billion to Settle Deepwater Horizon Oil Spill Claims." *Wall Street Journal*, July 2.

[2] Guardian Research. (2010). "BP Oil Spill Timeline." *The Guardian*, July 22.


Deepwater Horizon Buy and Hold Returns (t_0: explosion)
0.0
-0.1
-0.2
-0.3
Return
BP
RIG
APC
-120
-80
-40
0
Time


Deepwater Horizon CAAR
0.00
-0.05
-0.10
-0.15
-0.20
CAAR
Explosion
Obama Press Conf.
0
5
10
15
Time

This event also underscores the value of the related regressions: although the negative abnormal returns are very significant when the entire post-event window is considered, they are primarily concentrated in the late post-event window, following Obama's press conference.

Because this event study suggests that the President's press conference resulted in a larger, more sudden effect than the wellhead explosion, I conduct an additional event study where the event date is April 29th, the date of the press conference. This corresponds to a six trading day lag versus the previous model. With this specification, abnormal returns are immediately significant, suggesting that while the market did react to the initial disaster, it reacted even more when the extent of the damages was realized and when firm reputations suffered through presidential shaming.

Table 1: Deepwater Horizon Disaster

	Explosion ($n = 3$)			Obama Press Conf. ($n = 3$)		
time	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p
0	−0.0125	−1.7717	0.0765	−0.0826	−11.9273	0.0000
1	−0.0147	−1.4804	0.1388	−0.1137	−11.6054	0.0000
2	−0.0202	−1.6553	0.0979	−0.1300	−10.8407	0.0000
3	−0.0360	−2.5636	0.0104	−0.0891	−6.4329	0.0000
4	−0.0403	−2.5622	0.0104	−0.0938	−6.0562	0.0000
5	−0.0409	−2.3740	0.0176	−0.0723	−4.2644	0.0000
6	−0.1242	−6.6757	0.0000	−0.0785	−4.2864	0.0000
7	−0.1557	−7.8291	0.0000	−0.1540	−7.8601	0.0000
8	−0.1727	−8.1902	0.0000	−0.1461	−7.0328	0.0000
9	−0.1322	−5.9461	0.0000	−0.1620	−7.3963	0.0000
10	−0.1374	−5.8929	0.0000	−0.1493	−6.4979	0.0000
11	−0.1163	−4.7746	0.0000	−0.1364	−5.6844	0.0000
12	−0.1229	−4.8499	0.0000	−0.1465	−5.8651	0.0000
13	−0.1993	−7.5764	0.0000	−0.1417	−5.4698	0.0000
14	−0.1920	−7.0517	0.0000	−0.1414	−5.2721	0.0000
15	−0.2086	−7.4165	0.0000	−0.1384	−4.9949	0.0000
16	−0.1963	−6.7726	0.0000	−0.1466	−5.1336	0.0000
17	−0.1839	−6.1643	0.0000	−0.1831	−6.2309	0.0000
18	−0.1945	−6.3482	0.0000	−0.1596	−5.2875	0.0000
19	−0.1903	−6.0522	0.0000	−0.1404	−4.5348	0.0000

Table 2: Deepwater Horizon

	Dependent variable: Abnormal Daily Returns			
	Explosion		Obama Press Conf.	
$0 \leq t$	-0.010^{***}		-0.007^{***}	
	(0.002)		(0.002)	
$t = 0$		-0.012		-0.083^{***}
		(0.010)		(0.009)
$0 < t \leq 5$		-0.006		0.002
		(0.004)		(0.004)
$5 < t$		-0.011^{***}		-0.005^{*}
		(0.003)		(0.003)
Constant	-0.000	-0.000	-0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
AR Obs.	420	420	420	420
Event Obs.	3	3	3	3
Note:				*p<0.1; **p<0.05; ***p<0.01

3 Reputation Effects and New Information: The Effect of SRI Indices, Green Rankings, and Awards

As the Deepwater Horizon disaster shows, there are reasons why even traditional investors not focused on social responsibility might care about certain environmental impacts. Business, legal, and reputation risk stemming from environmental impact has an effect on financial performance, at least following a large disaster like Deepwater Horizon. In this paper, I test the hypothesis that information on corporate environmental performance can also constitute a signal to financial markets. In the following sections, I will look at the effect of inclusion and exclusion from the FTSE4Good socially responsible index, of "green rankings," and of environmental performance awards.

4 FTSE4Good SRI Index

One potential source of information regarding firms' environmental performance and reputation is inclusion in a SRI index. This source of information is a good candidate for an event study because the target audience of the information is the financial world and because the event (addition to and deletion from the index) is sudden and unanticipated. On announcement of inclusion in a SRI index, one might expect a positive abnormal return as socially responsible investors purchase the "good" firms' equity. Conversely, one might expect a negative abnormal return when firms are deleted from SRI indices as socially responsible investors sell the "bad" firms' equity. If the theory that socially responsible investing can be profitable is believed, then one might expect even some traditional investors without a socially-responsible mandate to follow suit. In this essay, I conduct several event studies to analyze the abnormal returns following the addition/deletion of US-based firms from the FTSE4Good Global Index.

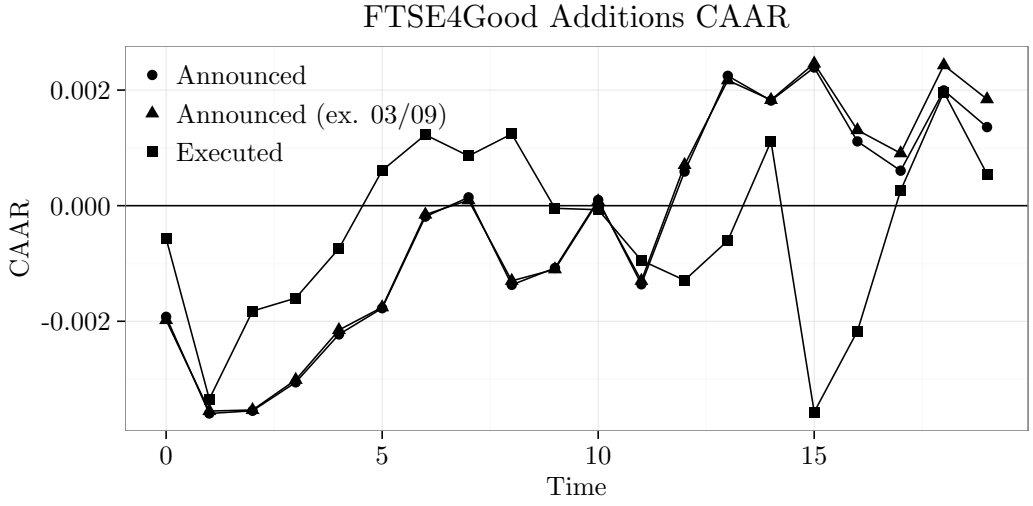
FTSE4Good Background & Methodology

The FTSE4Good Global Index was selected over other socially responsible indices (e.g. Calvert Responsible Index Series, S&P 500 Environmental and Socially Responsible Index, MSCI Globally Responsible Index) because of FTSE's reputation, because changes to the index are publicly available, and because index changes are announced well before the actual changes are made. The FTSE Group is a subsidiary of the London Stock Exchange and is known for its popular FTSE and Russell indices. As such, changes to the FTSE indices are more likely to be noticed than are changes to a less well-known index. It is important that changes to the index be available publicly, not just to index subscriber, because private information cannot serve as a market signal about firm reputations. It is also helpful that index changes are executed two weeks after their announcement, so that the effect of new information can be disentangled from the effect of buying and selling by funds that passively track the index. Some investors may actively trade on announcement of changes in anticipation passive tracking. Still, an effect on the date of announcement together with no effect on the date of execution would provide evidence of a behavior-influencing information signal. In contrast, if the announcements of changes were not registered by the market, one might expect an effect on the day that changes are executed due to passive tracking. These two effects support different conclusions in that the former is an indication that investors watch SRI index notices, while the latter would only provide evidence of the trivial conclusion that there exist funds that follow the index.

Firms are included in the FTSE4Good Global Index when they meet FTSE's environmental, social, and corporate governance (ESG) criteria. Stocks are eligible for inclusion if they are constituents of the FTSE Developed Index Series, a market capitalization weighted index of large and mid-cap companies in developed markets. The FTSE Developed Index Series has over 2,000 constituents, drawn from the FTSE all-world index which covers 3,049 stocks representing 98% of the world's investable market capitalization.[3][4]

At the heart of FTSE's ESG criteria is its ESG ratings model, which uses publicly available data to create a 0-5 ESG rating for each firm. The ESG ratings model is occasionally revised under the advice of an independent committee with experts from the investment community, companies, NGOs, unions and academia. Three hundred fifty indicators are used to score companies along fourteen themes. The environmental themes are climate change, water use, biodiversity, and pollution and resource use. The social themes are customer responsibility, human rights and community, labor standards, and health and safety. The governance themes are anti-corruption, tax transparency, risk management, and corporate governance. On average, 125 indicators are applicable to a company. The overall ESG rating used to determine inclusion in the FTSE4Good indices is absolute, not relative to the performance of peer companies. To be eligible for inclusion in the FTSE4Good Global index, firms must score above 3.2 overall and not score a 0 in any theme to which they are highly exposed. Firms that manufacture tobacco, weapons systems, or components for controversial weapons are excluded from the index regardless of ESG score. Firms on the index are notified when their ESG score drops below 2.5, and they are removed from the index 12 months later if their ESG score does not rebound. Because there is no public announcement when a firm's ESG score initially drops below 2.5, deletion is an unanticipated signal to investors.[5] [6]

[3] FTSE Group. (2016). "Index Inclusion Rules for the FTSE4Good Index Series v1.7."
[4] FTSE Group. (2016). "FTSE Developed Index Factsheet."
[5] FTSE Group. (2016). "FTSE ESG Methodology and Usage Summary."
[6] FTSE Group. (2016). "Index Inclusion Rules for the FTSE4Good Index Series v1.7."



FTSE4Good Event Studies

In order to conduct the event studies on inclusion and exclusion from the FTSE4Good Global Index, data was collected for each announcement of changes to the index since the index's inception in 2001. Essentially all of the changes were announced in semi-annual reports, with a small number of changes announced quarterly. From these reports, two data sets were constructed. The first contains all firms added to the index whose primary exchange is in the US. The second contains all US firms deleted from the index and whose reason for exclusion was no longer meeting the ESG criteria (i.e. not deletion from the FTSE Developed Index). Each data set contains the firm's stock ticker, the date of the announcement of the change, and the date the change was executed.

Using this data I conduct six event studies. On both the addition and the deletion data sets, I conduct an event study where the event date is the announcement date and where the event date is the execution date. For each data set, I also modify the announcement event study to exclude the March 2009 announcements because their timing coincided with that of the nadir of the S&P 500 during the financial crisis. This change only has a significant effect for deletions because just one firm was added in March 2009, while five were deleted. Because only publicly available information is used in sorting firms into the index, these event studies should test the effect of index changes on firms' reputation only, not information about actual environmental performance. However, because ESG information is complicated and not always easily accessible even when it is available, it is likely that FTSE provides new information regarding environmental performance to the market by aggregating hundreds of indicators.

FTSE4Good Global Index Additions

All three event studies regarding addition to the FTSE4Good Global Index point in the direction of no effect. At t_0, AAR is negative in all specifications, but not at any standard level of significance. At t_1, all three models report a weakly significant ($p < 0.10$) CAAR of around -35bps. However, that significance does not persist in the surrounding days or

throughout the post-event window, indicating that the t_1 result may be spurious. Furthermore, the related regressions show that abnormal returns are insignificant throughout the post-event period, and do not vary with time in the way that one would expect if the events had an effect. Especially in the event study where t_0 is the date of change execution, CAAR_1 can be considered spurious because there is no intuitive reason a negative effect should be observed. When the date of execution is considered, the passive effect of funds tracking the index is isolated. Because there is capital that tracks the index and there is not capital that tracks the inverse of the index, abnormal returns should be either zero (no effect) or they should be positive (effect).

Table 3: FTSE4Good Additions

	Dependent variable: Abnormal Daily Returns					
	Announced		Announced (ex. 03/09)		Executed	
$0 \leq t$	0.0001		0.0001		0.00003	
	(0.0003)		(0.0003)		(0.0003)	
$t = 0$		−0.002		−0.002		−0.001
		(0.001)		(0.001)		(0.001)
$0 < t \leq 5$		0.00003		0.00004		0.0002
		(0.001)		(0.001)		(0.001)
$5 < t$		0.0002		0.0003		−0.00000
		(0.0004)		(0.0004)		(0.0004)
Constant	0.000	0.000	0.000	0.000	0.000	0.000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
AR Obs.	18,060	18,060	17,920	17,920	18,060	18,060
Event Obs.	129	129	128	128	129	129

Note: *p<0.1; **p<0.05; ***p<0.01

Table 4: FTSE4Good Additions

	Announced ($n = 129$)			Announced ex. 03/09 ($n = 128$)			Executed ($n = 129$)		
time	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p
0	−0.0019	−1.4811	0.1386	−0.0020	−1.5213	0.1282	−0.0006	−0.4367	0.6623
1	−0.0036	−1.9580	0.0502	−0.0036	−1.9316	0.0534	−0.0033	−1.8279	0.0676
2	−0.0035	−1.5779	0.1146	−0.0035	−1.5692	0.1166	−0.0018	−0.8135	0.4159
3	−0.0031	−1.1771	0.2391	−0.0030	−1.1584	0.2467	−0.0016	−0.6178	0.5367
4	−0.0022	−0.7673	0.4429	−0.0022	−0.7397	0.4595	−0.0007	−0.2563	0.7977
5	−0.0018	−0.5579	0.5769	−0.0018	−0.5519	0.5810	0.0006	0.1923	0.8475
6	−0.0002	−0.0551	0.9561	−0.0002	−0.0449	0.9642	0.0012	0.3582	0.7202
7	0.0001	0.0392	0.9688	0.0001	0.0257	0.9795	0.0009	0.2349	0.8143
8	−0.0014	−0.3517	0.7250	−0.0013	−0.3332	0.7390	0.0012	0.3195	0.7494
9	−0.0011	−0.2627	0.7928	−0.0011	−0.2676	0.7890	−0.0000	−0.0112	0.9910
10	0.0001	0.0230	0.9816	0.0001	0.0176	0.9860	−0.0001	−0.0163	0.9870
11	−0.0014	−0.3025	0.7623	−0.0013	−0.2886	0.7729	−0.0009	−0.2111	0.8328
12	0.0006	0.1261	0.8997	0.0007	0.1502	0.8806	−0.0013	−0.2765	0.7822
13	0.0022	0.4623	0.6438	0.0022	0.4458	0.6557	−0.0006	−0.1249	0.9006
14	0.0018	0.3616	0.7177	0.0018	0.3632	0.7164	0.0011	0.2218	0.8245
15	0.0024	0.4602	0.6453	0.0025	0.4728	0.6364	−0.0036	−0.6897	0.4904
16	0.0011	0.2077	0.8354	0.0013	0.2438	0.8074	−0.0022	−0.4067	0.6842
17	0.0006	0.1099	0.9125	0.0009	0.1644	0.8694	0.0003	0.0476	0.9621
18	0.0020	0.3524	0.7245	0.0024	0.4287	0.6682	0.0020	0.3483	0.7276
19	0.0014	0.2340	0.8150	0.0018	0.3167	0.7515	0.0005	0.0943	0.9248

FTSE4Good Global Index Deletions

The three event studies regarding deletion from the FTSE4Good Global Index provide evidence that investors react negatively to the signal provided through announcement of exclusion from the index. In the event study for announcement of deletion, average returns are 40bps below what would normally be expected ($p < 0.05$). CAAR is weakly significant at several points in the post-event period, but the related regression indicates that abnormal returns are not different from pre-event abnormal returns at a statistically significant level.

In the model for announcement of deletion that excludes the firms that were deleted during the trough of the financial crisis, the results are even more significant. At t_0 there is a strongly significant -44bp average abnormal return ($p < 0.01$). Cumulative average abnormal returns are significant throughout most of the post-event window, however the related regressions indicate that this significance is largely the result of initial drop. This shows that the market incorporated most of the signal's effect quickly.

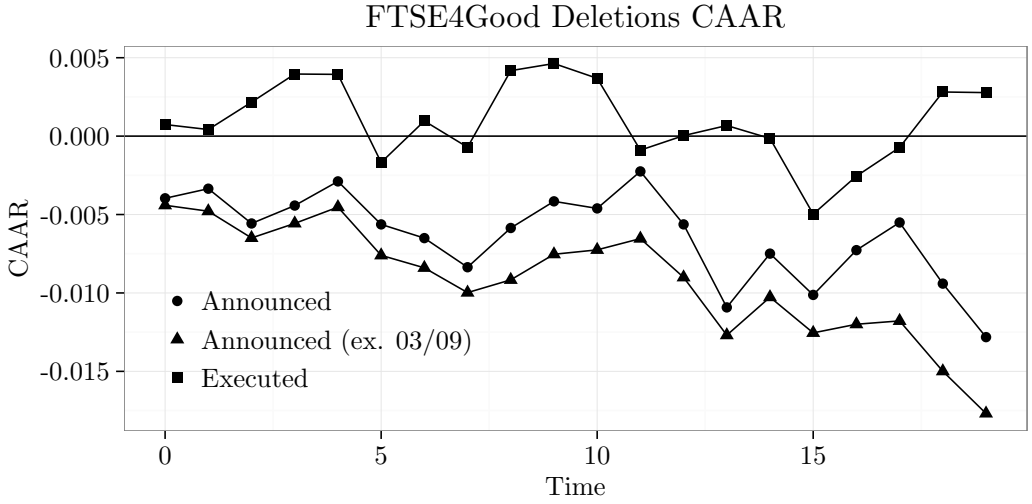
The model in which the event dates are the dates when the changes to the index are actually executed provides evidence that the effect of deletion from the index is fully realized when the announcement is made. Either passive tracking of the index does not affect share prices of affected firms or it is anticipated by active investors. At no point in the post-event window is there a statistically significant CAAR at any of the standard levels. The related regressions confirm this evidence in that none of the time-period dummy variables is significant. This provides additional support for the spuriousness of the t_1 result in the execution of additions event study.

Table 5: FTSE4Good Deletions

	Dependent variable: Abnormal Daily Returns					
	Announced		Announced (ex. 03/09)		Executed	
$0 \leq t$	-0.001		-0.001^{**}		0.0001	
	(0.0004)		(0.0004)		(0.0004)	
$t = 0$		-0.004^{**}		-0.004^{***}		0.001
		(0.002)		(0.002)		(0.002)
$0 < t \leq 5$		-0.0003		-0.001		-0.0005
		(0.001)		(0.001)		(0.001)
$5 < t$		-0.001		-0.001		0.0003
		(0.0005)		(0.0005)		(0.0005)
Constant	-0.000	0.000	0.000	0.000	0.000	-0.000
	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0002)	(0.0002)
AR Obs.	13,860	13,860	13,160	13,160	13,860	13,860
Event Obs.	99	99	94	94	99	99
Note:						*p<0.1; **p<0.05; ***p<0.01

Discussion of the FTSE4Good Event Studies

Taken together, these event studies on the FTSE4Good Global Index provide evidence that the market does react to changes in the index, but only when firms are excluded from the index and not when they are added. This asymmetry could be taken to provide skepticism



on the results in the case of exclusion. However, it is also possible that the market cares more about negative shocks to firms reputations than positive shocks. It is also possible that good environmental performance is more visible before the firm is included in the index: it makes sense that a firm would make an effort to inform markets of their environmental performance on their own through annual reports and other corporate communications when their performance is good, but not when it is bad. Accordingly, signals of poor performance through exclusion from the index would be unanticipated and therefore captured in the event study, whereas addition to the index would not provide any unanticipated information.

Table 6: FTSE4Good Deletions

	Announced ($n = 99$)			Announced ex. 03/09 ($n = 94$)			Executed ($n = 99$)		
time	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p
0	−0.0040	−2.3091	0.0209	−0.0044	−2.7252	0.0064	0.0007	0.4291	0.6679
1	−0.0034	−1.3812	0.1672	−0.0048	−2.0921	0.0364	0.0004	0.1724	0.8631
2	−0.0056	−1.8733	0.0610	−0.0065	−2.3171	0.0205	0.0022	0.7250	0.4684
3	−0.0044	−1.2899	0.1971	−0.0056	−1.7201	0.0854	0.0040	1.1490	0.2506
4	−0.0029	−0.7521	0.4520	−0.0045	−1.2516	0.2107	0.0039	1.0216	0.3070
5	−0.0056	−1.3389	0.1806	−0.0076	−1.9182	0.0551	−0.0017	−0.3971	0.6913
6	−0.0065	−1.4319	0.1522	−0.0084	−1.9621	0.0498	0.0010	0.2117	0.8324
7	−0.0084	−1.7217	0.0851	−0.0100	−2.1806	0.0292	−0.0007	−0.1453	0.8845
8	−0.0059	−1.1375	0.2553	−0.0092	−1.8883	0.0590	0.0042	0.8073	0.4195
9	−0.0042	−0.7661	0.4436	−0.0075	−1.4724	0.1409	0.0046	0.8497	0.3955
10	−0.0046	−0.8096	0.4182	−0.0073	−1.3516	0.1765	0.0037	0.6451	0.5189
11	−0.0022	−0.3783	0.7052	−0.0065	−1.1662	0.2435	−0.0009	−0.1498	0.8809
12	−0.0056	−0.9093	0.3632	−0.0090	−1.5437	0.1227	0.0000	0.0052	0.9958
13	−0.0109	−1.7005	0.0890	−0.0127	−2.0970	0.0360	0.0007	0.1047	0.9166
14	−0.0075	−1.1270	0.2597	−0.0103	−1.6389	0.1012	−0.0001	−0.0221	0.9824
15	−0.0101	−1.4747	0.1403	−0.0125	−1.9388	0.0525	−0.0050	−0.7215	0.4706
16	−0.0073	−1.0274	0.3042	−0.0120	−1.7982	0.0721	−0.0026	−0.3591	0.7195
17	−0.0055	−0.7563	0.4495	−0.0118	−1.7166	0.0861	−0.0007	−0.0987	0.9213
18	−0.0094	−1.2571	0.2087	−0.0150	−2.1260	0.0335	0.0028	0.3747	0.7079
19	−0.0128	−1.6695	0.0950	−0.0177	−2.4444	0.0145	0.0028	0.3601	0.7188

5 Green Rankings

Like SRI indices, green rankings are potential signals of both reputation information and information on actual environmental performance. I examine the two most prominent rankings of companies on the basis of sustainability: the Newsweek Green Rankings and the Carbon Disclosure Project rankings. Apart from a weakly significant association between better rankings and better abnormal returns at t_0, the Newsweek Green Rankings do not support the hypothesis that the publication of rankings has an impact on financial performance. The results of the Carbon Disclosure Project rankings are less straightforward. Top performance and non-disclosure are associated with negative abnormal returns, but bottom performance, changes in performance, and changes in disclosure are not associated with significant abnormal returns.

5.1 Newsweek Green Rankings

Newsweek Background & Methodology

The Newsweek Green Rankings are an annual ranking of the environmental performance of the largest 500 companies that has been published since 2009. The Newsweek Green Rankings were the first environmental rankings released by a major media organization to use quantitative data. Whereas inclusion and exclusion from the FTSE4Good Global Index is only likely to be observed by investors, the Newsweek Green Rankings may be seen by both investors and the general public. So, while changes to the FTSE4Good Global Index may provide information about a firm's environmental performance, make such information known to investors, or impact the firm's environmental reputation among investors, the Newsweek Green Rankings are more likely to also affect firms' reputations among their customers and suppliers.

Each year, Newsweek publishes a ranking of the 500 largest U.S. companies and a separate ranking of the largest global companies. In the following event studies, I use data from all available years (2010, 2011, 2012, 2014, 2015) on the U.S. rankings. Over the five available years of Newsweek Green Rankings, the methodology has undergone two significant changes, one between 2010 and 2011, and one between 2012 and 2014. No rankings were published in 2013.

The 2015 Green Rankings are based on research from Corporate Knights Capital and HIP (Human Impact + Profit) Investor Inc. The 500 largest U.S.-headquartered, publicly traded companies by market capitalization are included in the rankings. Rankings are determined according to a "green score" which is derived from eight quantitative performance factors. Data for the factors comes from public information available through annual reports, audited financial statements, proxy statements, sustainability reports, HIP investor, Bloomberg, and the Carbon Disclosure Project. Performance is relative to industry group peers. The overall green score is the weighted average of energy productivity (15%), greenhouse gas productivity (15%), water productivity (15%), waste productivity (15%), green revenue (20%), sustainability pay links (10%), sustainability board committees (5%), and audited environmental metrics (5%). Companies receive a score of 0 for any factor for which sufficient information was not disclosed by the company. Details on these eight performance factors are available through Newsweek.[7] The 2014 Green Rankings use a nearly identical methodology,

[7] Newsweek, Corporate Knights Capital, and HIP Investor. (2015). "2015 Newsweek Green Rankings Final Methodology."

except that a reputation factor replaces the green revenue factor.[8]

The 2012 Green Rankings are based on research from Trucost and Sustainalytics. Unlike the 2014 and 2015 rankings, the 2012 rankings use the 500 largest companies by a combination of revenue, market capitalization, and number of employees, not just market capitalization. Rankings are comprised of a weighted average of environmental impact (45%), environmental management (45%), and disclosure (10%) scores. Rankings are not relative to industry group peers. The impact score uses over 700 metrics provided by Trucost that describe a firms environmental footprint. The management score uses data from Sustainalytics that characterizes the quality of company environmental policies, programs, and targets. The disclosure score incorporates data from both Trucost and Sustainalytics. The 2011 rankings use an identical methodology.[9]

Like the 2012 and 2011 rankings, the 2010 Green Rankings examine the 500 largest companies by revenue, market capitalization, and number of employees. Companies on the 2010 list are ranked according the the weighted average of environmental impact (45%), green policies (45%), and environmental reputation (10%). The environmental impact score methodology is identical to that in 2011 and 2012. The green policies score uses data from MSCI to accomplish the same thing as the 2011 and 2012 environmental management score. The reputation score uses a survey of CSR professionals and academics created for Newsweek by CorporateRegister.[10]

Top Rankings & Bottom Rankings

First, I examine whether attaining a particularly high or low ranking constitutes a signal to financial markets. Although the entire rankings are publicly available, news reports on the Green Rankings have tended to focus on the top ten firms. I first conduct an event study where the event is the date of release of the ranking in which the firm ranked in the top ten. Cumulative average abnormal returns are close to zero, and the null hypothesis that the event did not induce a change in market price is not rejected at any standard level of significance. The related regressions corroborate this result: in neither specification does any time dummy variable report significance.

I then conduct another event study where being ranked in the bottom ten constitutes an event. When many firms are tied for last place, all are included in the data set. Because there were several years in which many firms were tied for last place, the bottom rank data set is far larger (104 event observations vs. 45 event observations). As with the top ten event study, being ranked in the bottom ten does not constitute a signal to financial markets. CAAR is not significant at any standard level of significance at any point in the post-event window. The related regressions show that abnormal returns do not significantly vary throughout the post-event window.

[8] Newsweek, and Corporate Knights Capital. (2014). "2014 Newsweek Green Rankings Final Methodology."

[9] Newsweek. (2012). "2012 Newsweek Green Rankings: Frequently Asked Questions."

[10] Newsweek. (2010). "Green Rankings: 2010 Full Methodology."

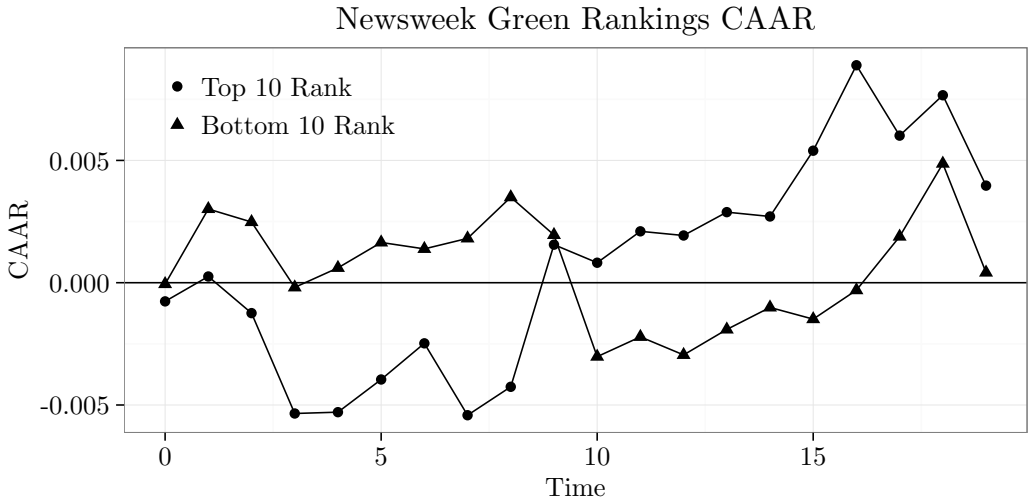


Table 7: Newsweek Green Rankings

	Dependent variable: Abnormal Daily Returns			
	Top 10 Rank		Bottom 10 Rank	
$0 \leq t$	0.0002		0.00002	
	(0.001)		(0.0004)	
$t = 0$		−0.001		−0.0001
		(0.003)		(0.001)
$0 < t \leq 5$		−0.001		0.0003
		(0.001)		(0.001)
$5 < t$		0.001		−0.0001
		(0.001)		(0.0004)
Constant	0.000	0.000	0.000	−0.000
	(0.0002)	(0.0002)	(0.0001)	(0.0001)
AR Obs.	6,300	6,300	14,560	14,560
Event Obs.	45	45	104	104
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 8: Newsweek Green Rankings

	Top 10 Rank ($n = 45$)			Bottom 10 Rank ($n = 104$)		
time	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p
0	−0.0008	−0.2949	0.7681	−0.0001	−0.0364	0.9710
1	0.0003	0.0695	0.9446	0.0030	1.4134	0.1575
2	−0.0012	−0.2773	0.7815	0.0025	0.9501	0.3421
3	−0.0053	−1.0326	0.3018	−0.0002	−0.0633	0.9496
4	−0.0053	−0.9142	0.3606	0.0006	0.1800	0.8572
5	−0.0040	−0.6239	0.5327	0.0016	0.4458	0.6557
6	−0.0025	−0.3618	0.7175	0.0014	0.3466	0.7289
7	−0.0054	−0.7398	0.4594	0.0018	0.4249	0.6709
8	−0.0043	−0.5478	0.5838	0.0035	0.7728	0.4396
9	0.0016	0.1900	0.8493	0.0020	0.4097	0.6820
10	0.0008	0.0951	0.9242	−0.0030	−0.6048	0.5453
11	0.0021	0.2342	0.8149	−0.0022	−0.4239	0.6717
12	0.0019	0.2067	0.8362	−0.0030	−0.5431	0.5871
13	0.0029	0.2978	0.7659	−0.0019	−0.3390	0.7346
14	0.0027	0.2700	0.7872	−0.0010	−0.1733	0.8624
15	0.0054	0.5211	0.6023	−0.0015	−0.2469	0.8050
16	0.0089	0.8328	0.4050	−0.0003	−0.0491	0.9608
17	0.0060	0.5474	0.5841	0.0019	0.2947	0.7682
18	0.0077	0.6791	0.4971	0.0049	0.7408	0.4588
19	0.0040	0.3428	0.7318	0.0004	0.0617	0.9508

Effect of Firm Ranking on Abnormal Returns

Because there are only five years, the top ten and bottom ten data sets contain a limited number of observations. Thus, a small effect would not captured in the event study. In order to test whether higher rankings are associated with greater abnormal returns, I calculate abnormal returns for every firm in each year and regress ranking on those abnormal returns. Each year therefore provides many more observations, so small effects can be noticed. Specifically, I use the following two regression specifications:

$$(1) \quad \hat{\text{AR}}_{it} = \hat{\beta}_0 + \hat{\beta}_1 d_{t\geq 0} + \hat{\beta}_2 r_{it} + \hat{\beta}_3 (r_{it} \times d_{t\geq 0}) + \hat{\epsilon}_{it}$$

$$(2) \quad \hat{\text{AR}}_{it} = \hat{\beta}_0 + \hat{\beta}_1 d_{t=0} + \hat{\beta}_2 d_{0<t\leq 5} + \hat{\beta}_3 d_{5<t} + \hat{\beta}_4 r_{it} + \hat{\beta}_5 (r_{it} \times d_{t=0}) + \hat{\beta}_6 (r_{it} \times d_{0<t\leq 5}) + \hat{\beta}_7 (r_{it} \times d_{5<t}) + \hat{\epsilon}_{it}$$

where r_{it} is the ranking for firm i at time t. In addition to the dummy variables used to analyze abnormal returns for the other event studies, I include a variable for rank and interaction variables between rank and each dummy variable. These regressions will therefore provide estimates for the effect of ranking well and also decompose that effect across multiple time periods in the post-event window.

The first specification indicates that ranking well does not impact abnormal returns during the post-event period. Even though there are 320,000 observations, no independent variable is significantly different from zero.

The second specification with additional time dummy variables and interaction variables reports weak significance of rank on the day the rankings were released. The negative estimate on this variable means that lower rankings are associated with below-expected returns. Although the estimate is only −0.4bps, this implies that a difference of rank of one hundred spots would correspond to a much more material 40bps spread, on average.

Table 9: Newsweek Green Rankings: Effect of Rank

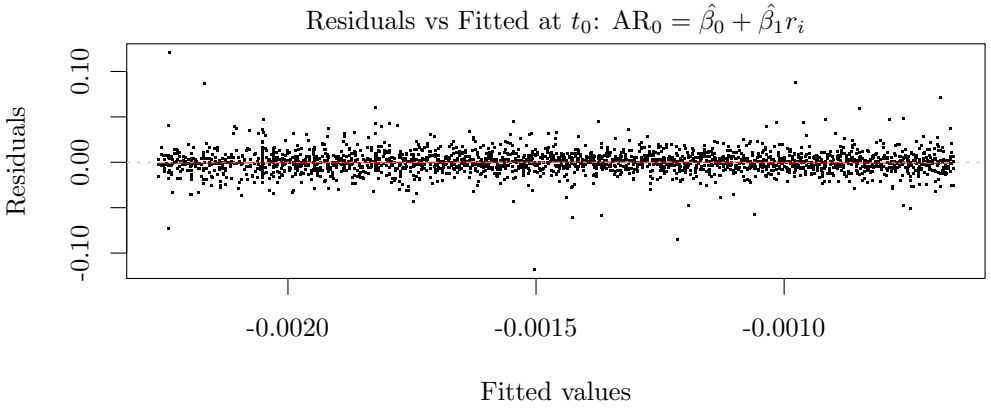
	Dependent variable:	
	Abnormal Daily Returns	
	(1)	(2)
$0 \leq t$	0.0001	
	(0.0001)	
Rank	0.000	0.000
	(0.00000)	(0.00000)
Rank $\times$ $0 \leq t$	0.00000	
	(0.00000)	
$t = 0$		−0.0003
		(0.001)
$0 < t \leq 5$		0.001**
		(0.0003)
$5 < t$		−0.00004
		(0.0002)
Rank $\times$ $t = 0$		−0.000004*
		(0.00000)
Rank $\times$ $0 < t \leq 5$		0.00000
		(0.00000)
Rank $\times$ $5 < t$		0.00000
		(0.00000)
Constant	0.000	−0.000
	(0.0001)	(0.0001)
AR Obs.	320,180	320,180
Event Obs.	2,287	2,287
Note:	*p<0.1; **p<0.05; ***p<0.01	

Even though placing in the top ten or bottom ten of the Newsweek Green Rankings does not have a statistically significant effect, one might still expect certain rankings to be more important to the market than others. Differences in rank toward the top and bottom are probably more important than differences in the middle. For example, the market may register a difference between ranking 1st and 10th, but not register a difference between ranking 201st and 210th, even though the difference in places is the same. I test this hypothesis on the potentially significant $t = 0$ results by examining the residuals of the following regression:

$$\hat{\text{AR}}_0 = \hat{\beta}_0 + \hat{\beta}_1 r_i$$

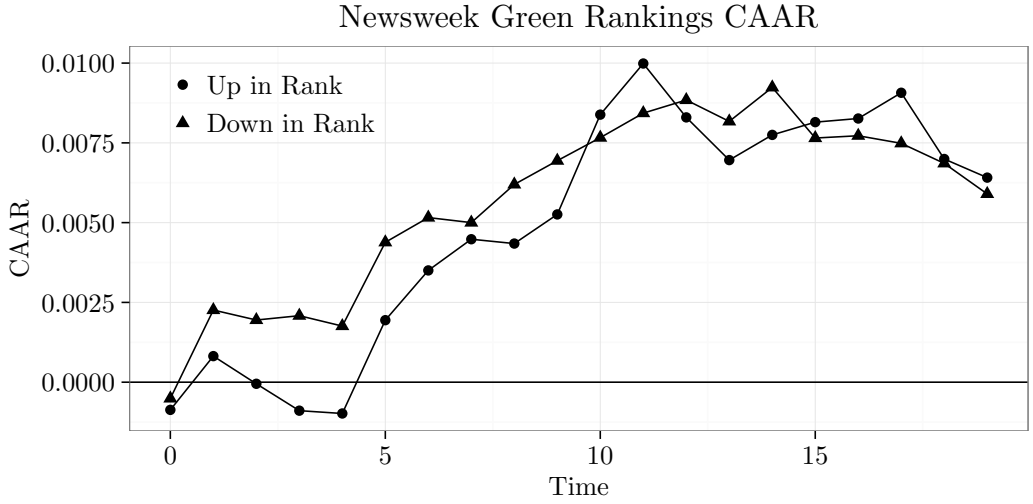
As the plot of residuals versus fitted values shows, the relationship between rank and

abnormal returns appears linear. When second and third degree polynomial terms are included in the regression, neither polynomial term is significant and the linear term retains roughly its prior estimate and level of significance. Further, the Breusch-Pagan test does not reject the null hypothesis of homoskedasticity in the linear specification ($p = 0.7036$). These results can be interpreted in one of two ways. First, they can be taken as evidence that differences in ranking are equally important to the market at each level of the rankings. Second, they can be taken as evidence that the weakly significant effect of rank on abnormal returns at t_0 is spurious. In general, the results of a model whose specification is unintuitive should be considered cautiously. Given that rank does not impact abnormal returns in the way that one might initially expect, a linear, homoskedastic relationship can be interpreted as casting doubt on the t_0 result.



Changes in Rank

Although Newsweek's methodology is regularly changed, it is possible that a firm's ranking does not provide news to the market if the firm's prior ranking is similar. That is, if a firm was ranked number one in a prior year, ranking number one again might not provide any new information to the market. In order to explore whether this hypothesis explains why the prior event studies on the Newsweek rankings did not show a strong effect, I conduct an event study where changes in rankings are considered. Using the date of the rankings release as the event date, I create two data sets. The first contains all firms whose ranking improved and the second contains all firms whose ranking worsened. I calculate CAAR for each data set and run the related regressions on abnormal returns.



Moving up in rank is associated with strongly significant positive CAAR throughout the late post-event period. At t_0 there is a weakly significant 9bp negative AAR. However, moving down in rank is also associated with strongly significant positive CAAR throughout almost all of the post-event period. The related regressions show that abnormal returns do not vary throughout the post-event period.

Because changes in rank in either direction exhibit similar effects, and because there are only seventeen observations of no change in ranking, this study merely provides evidence that the firms in the Newsweek ranking did, on average, better than expected during the post-event period. Because this is a list of the 500 largest companies, not the 500 most environmental companies, this effect is unrelated to the question of whether the market reacts to environmental rankings.

To show more decisively that the CAAR is unrelated to ranking, I test they hypothesis that the two time series of CAAR estimates have the same true value. I calculate the following test statistic at each time in the post-event window:

$$t_{\text{CAAR}} = \frac{\hat{\text{CAAR}}_{up} - \hat{\text{CAAR}}_{down}}{\sigma(\hat{\text{CAAR}}_{up}) + \sigma(\hat{\text{CAAR}}_{down})}$$

At every point in the post-event window, the test statistic is close to zero, providing strong evidence that the market does not differentiate between improvements and declines in the Newsweek Green Rankings. I verified this result by regressing changes in rank on abnormal returns in the post event period using the same methodology that I used to study the effect of rank. The time-period dummy variables capture the effect of the increase in share prices that were observed across the sample, so the effect of changes in rank can be isolated. No interaction variable was significant in either specification, providing evidence that changes in rank have no effect on market values.

Combined with the previous result that ranking well does not seem to affect firms returns (with the possible exception of the weak association between rank and abnormal returns at t_0), it seems that the market does not regard the Newsweek Green Rankings as a signal of environmental performance or as a change to firm reputations.

Table 10: Newsweek Green Rankings: Change in Rank

	Dependent variable:	
	Abnormal Daily Returns	
	(1)	(2)
$0 \leq t$	0.0001^{***}	
	(0.0000)	
Change	-0.000	0.000
	(0.00000)	(0.00000)
Change $\times$ $0 \leq t$	-0.00000	
	(0.00000)	
$t = 0$		-0.0006^{*}
		(0.0003)
$0 < t \leq 5$		0.0008^{**}
		(0.0002)
$5 < t$		-0.0002^{**}
		(0.00009)
Change $\times$ $t = 0$		-0.00000
		(0.00000)
Change $\times$ $0 < t \leq 5$		-0.00000
		(0.00000)
Change $\times$ $5 < t$		0.00000
		(0.00000)
Constant	0.000	-0.000
	(0.0001)	(0.0001)
AR Obs.	228,200	228,200
Event Obs.	1,630	1,630
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 11: Newsweek Green Rankings

	Up in Rank ($n = 781$)			Down in Rank ($n = 831$)			Difference		
time	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p
0	−0.0009	−1.8283	0.0675	−0.0005	−1.0424	0.2972	−0.0004	−0.3705	0.7110
1	0.0008	1.2172	0.2235	0.0023	3.2658	0.0011	−0.0014	−0.7491	0.4538
2	−0.0000	−0.0601	0.9521	0.0019	2.2978	0.0216	−0.0020	−0.6908	0.4897
3	−0.0009	−0.9402	0.3471	0.0021	2.1283	0.0333	−0.0030	−0.7718	0.4402
4	−0.0010	−0.9240	0.3555	0.0018	1.6065	0.1082	−0.0027	−0.5682	0.5699
5	0.0019	1.6717	0.0946	0.0044	3.6553	0.0003	−0.0024	−0.4219	0.6731
6	0.0035	2.7905	0.0053	0.0052	3.9825	0.0001	−0.0017	−0.2453	0.8062
7	0.0045	3.3386	0.0008	0.0050	3.6118	0.0003	−0.0005	−0.0675	0.9461
8	0.0043	3.0521	0.0023	0.0062	4.2192	0.0000	−0.0019	−0.2135	0.8309
9	0.0053	3.5043	0.0005	0.0069	4.4832	0.0000	−0.0017	−0.1745	0.8614
10	0.0084	5.3282	0.0000	0.0077	4.7191	0.0000	0.0007	0.0681	0.9457
11	0.0100	6.0758	0.0000	0.0084	4.9716	0.0000	0.0016	0.1344	0.8931
12	0.0083	4.8503	0.0000	0.0088	5.0094	0.0000	−0.0005	−0.0435	0.9653
13	0.0070	3.9203	0.0001	0.0082	4.4612	0.0000	−0.0012	−0.0898	0.9284
14	0.0077	4.2172	0.0000	0.0092	4.8718	0.0000	−0.0015	−0.1029	0.9181
15	0.0081	4.2935	0.0000	0.0077	3.9069	0.0001	0.0005	0.0323	0.9743
16	0.0083	4.2236	0.0000	0.0077	3.8260	0.0001	0.0005	0.0329	0.9737
17	0.0091	4.5055	0.0000	0.0075	3.6039	0.0003	0.0016	0.0913	0.9273
18	0.0070	3.3817	0.0007	0.0069	3.2133	0.0013	0.0001	0.0075	0.9940
19	0.0064	3.0212	0.0025	0.0059	2.6944	0.0071	0.0005	0.0265	0.9788

5.2 Carbon Disclosure Project

CDP Background & Methodology

The Carbon Disclosure Project is an independent group established to help inform investors on issues related to corporate climate change mitigation. The CDP works with over 800 institutional investors representing $95 trillion of investments in order to encourage corporate disclosure of environmental impacts and reveal environmental risk in investment portfolios. Each year, they rate the constituents of S&P 500 on their carbon disclosure and performance. Unlike the Newsweek Green Rankings, the CDP is concerned with climate change and greenhouse gas emissions, not environmentalism in general. Accordingly, water pollution, waste, toxic release, and other environmental harms do not factor into CDP rankings. Notably, CDP scores are included in Google Finance and Bloomberg Terminals.

CDP collects the data for their scores by surveying the companies in the S&P 500. They request information on management (governance, targets, initiatives), climate change risks and opportunities (regulatory, physical), and carbon emissions. The disclosure score is based on how much firms disclose as well as the quality of information. The performance score is based on how well firms are doing along the dimensions they disclosed. Firms only receive a disclosure score if they respond to the survey, and they only receive a performance score if their disclosure score is above 50. Full details on scoring are transparent and publicly available.[11]

Event Studies

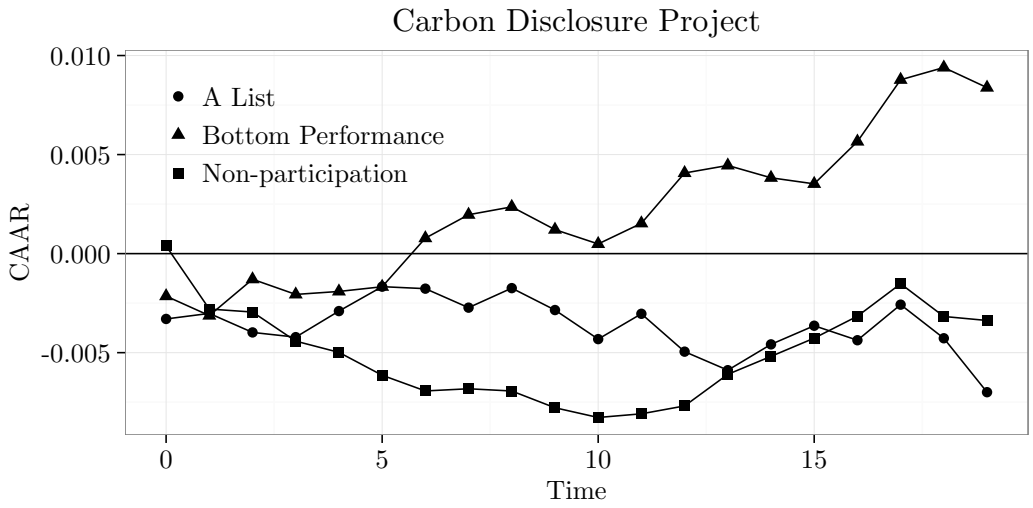
In order to determine the effect of the Carbon Disclosure Project's S&P 500 reports on the financial performance of included firms, I conduct five related event studies. In the first, I examine whether firms that are recognized for top performance with inclusion on the CDP A List are rewarded with abnormal returns. I also examine whether scoring in the lowest performance band results in a penalty in financial markets. Third, I examine the effect on non-participation. As with the Newsweek Green Rankings, it is also possible that changes in rank are more significant than the actual rank, so I conduct two additional event studies: one on changes in disclosure score, and one on changes in performance band. With a similar methodology to that used to analyze the effect of the Newsweek rank, I use OLS to estimate the effect of changes on abnormal returns.

For all CDP event studies, I include data from the CDP reports each year from 2010 through 2015, and exclude firms who were delisted, merged with a large company, or acquired by another entity during the time of the event study. Exclusion is appropriate under the reasonable assumption that the corporate financial events were unrelated to the announcement of carbon performance by the CDP.

The A List

I begin analysis on the CDP reports by examining whether the firms that are recognized for top carbon performance with a position on the CDP A List (previously, the Carbon Performance Leadership Index) are rewarded in the financial markets with positive abnormal returns. One might expect positive abnormal returns as socially responsible investors purchase the firms' equity or as non-socially responsible investors reward improved reputation and potential "green profits."

[11] Carbon Disclosure Project. (2015). "CDP 2015 Climate Change Scoring Methodology."



However, there are strongly significant ($p = 0.00056$) abnormal returns of -33bps on the day that top performance is announced. While CAAR remains negative throughout the post-event period, the significance of the original drop is eroded over the post-event window as abnormal returns diminish in magnitude. The related regressions show that the only period with significant abnormal returns is the day the report is released.

One possible interpretation of this result is that the market does react to the information provided by the CDP report, but that they react negatively to top carbon performance. In this account, the market immediately incorporates the information on the day the report is released, and there are no knock-on effects later. It is possible that traditional investors consider spending on climate change mitigation a waste of money that improves neither business performance nor consumer reputation. Accordingly, recognition of top mitigation performance would be an indicator that those firms are less valuable.

Another possible interpretation is that this result is spurious. Given that significance does not persist throughout the post-event window, this is not an implausible result. However, I reproduced the event study on each year separately, and found a negative abnormal return at $t = 0$ every year the report is released. This consistency provides evidence that the result is not spurious.

Bottom Performance

Following the results of A List event study, one might expect the market to react symmetrically by rewarding firms that score poorly. In this event study I consider all firms who get the bottom ranking (E) in the CDP reports, and use the date of the release of the report as the event date. At no point in the post-event window is CAAR significantly different from zero. Except for a weakly significant +10bp set of abnormal returns late in the post-event window, the null hypothesis that average abnormal returns is zero is not rejected by any of the time-period dummy variables.

This result provides evidence that the market does not react to poor carbon performance in the CDP Climate Change reports. Given that bottom performers are unlikely to provide press releases on recognition of their weak performance, and given that the news media tend

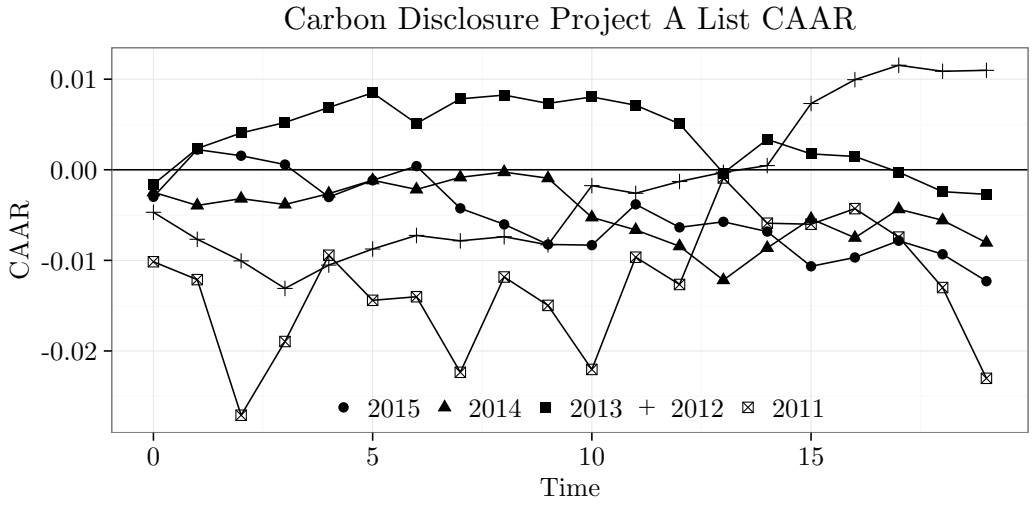


Table 12: Carbon Disclosure Project

	Dependent variable: Abnormal Daily Returns					
	A List		Bottom Performance		Non-participation	
$0 \leq t$	−0.0003		0.0004		−0.0002	
	(0.0002)		(0.0003)		(0.0001)	
$t = 0$		−0.003***		−0.002		0.0004
		(0.001)		(0.001)		(0.001)
$0 < t \leq 5$		0.0003		0.0001		−0.001***
		(0.0004)		(0.001)		(0.0002)
$5 < t$		−0.0004		0.001*		0.0002
		(0.0003)		(0.0004)		(0.0001)
Constant	−0.000	−0.000	0.000	−0.000	0.000	0.000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.00005)	(0.00005)
AR Obs.	20,860	20,860	13,020	13,020	123,200	123,200
Event Obs.	149	149	93	93	881	881

Note: *p<0.1; **p<0.05; ***p<0.01

to focus on top performers, the result of this event study makes intuitive sense. Even when information is made available, if it is not seen by investors then it will not be incorporated in share prices.

Non-Participation

In order to motivate firms to disclose their environmental performance, the Climate Disclosure Project prominently displays in their reports the firms that did not respond to information requests. This tactic has worked: since the inception of the CDP report, an increasing number firms have responded. Although there is essentially no effect on the day that the report is released, there are significant, consistent negative abnormal returns in the ten days following publication. Negative CAAR is strongly significant until t_{14}. At its lowest point, cumulative abnormal returns averaged -83bps. The related regressions show strongly significant negative abnormal returns during the early post-event window. Consistent negative abnormal returns early in the post-event window demonstrate that announced information is not immediately incorporated into share prices.

This result provides evidence that the market penalizes non-participation in the CDP report. It is possible that investors assume that non-participation is an indication that firms are hiding a result to which the market would negatively react. Given that deletion from the FTSE4Good index results in significant negative abnormal returns, it is possible that the market punishes particularly poor environmental performance. This does not necessarily contradict the results from the CDP bottom performance band event study if one assumes that the worst disclosed results are still better than the average undisclosed result. Similarly, it does not necessarily contradict the negative returns observed in the A List study: investors may prefer middle-of-the-road environmental performance that is sufficient to mitigate a degree of reputation and legal risk, but not so extreme as to constitute an unprofitable waste.

Table 13: Carbon Disclosure Project

	A List ($n = 149$)			Bottom Performance ($n = 93$)			Non-Participation ($n = 881$)		
time	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p
0	−0.0033	−3.4487	0.0006	−0.0021	−1.4852	0.1375	0.0004	0.7575	0.4487
1	−0.0030	−2.2320	0.0256	−0.0031	−1.5304	0.1259	−0.0028	−3.8986	0.0001
2	−0.0040	−2.4012	0.0163	−0.0013	−0.5169	0.6052	−0.0030	−3.3559	0.0008
3	−0.0042	−2.2043	0.0275	−0.0021	−0.7126	0.4761	−0.0044	−4.3531	0.0000
4	−0.0029	−1.3567	0.1749	−0.0019	−0.5909	0.5546	−0.0050	−4.3935	0.0000
5	−0.0017	−0.7124	0.4762	−0.0017	−0.4725	0.6365	−0.0061	−4.9395	0.0000
6	−0.0018	−0.6991	0.4845	0.0008	0.2041	0.8383	−0.0069	−5.1626	0.0000
7	−0.0027	−1.0086	0.3132	0.0020	0.4801	0.6312	−0.0068	−4.7527	0.0000
8	−0.0017	−0.6075	0.5435	0.0024	0.5441	0.5864	−0.0069	−4.5550	0.0000
9	−0.0028	−0.9420	0.3462	0.0012	0.2649	0.7911	−0.0078	−4.8486	0.0000
10	−0.0043	−1.3607	0.1736	0.0005	0.1016	0.9190	−0.0083	−4.9146	0.0000
11	−0.0030	−0.9171	0.3591	0.0015	0.3054	0.7601	−0.0081	−4.6001	0.0000
12	−0.0049	−1.4351	0.1513	0.0041	0.7808	0.4349	−0.0077	−4.2017	0.0000
13	−0.0059	−1.6444	0.1001	0.0045	0.8231	0.4105	−0.0061	−3.2098	0.0013
14	−0.0046	−1.2369	0.2161	0.0038	0.6837	0.4941	−0.0052	−2.6393	0.0083
15	−0.0036	−0.9517	0.3413	0.0035	0.6090	0.5425	−0.0043	−2.1023	0.0355
16	−0.0044	−1.1087	0.2676	0.0057	0.9492	0.3425	−0.0032	−1.5104	0.1309
17	−0.0026	−0.6351	0.5253	0.0088	1.4309	0.1525	−0.0015	−0.7073	0.4794
18	−0.0043	−1.0252	0.3053	0.0094	1.4911	0.1359	−0.0032	−1.4347	0.1514
19	−0.0070	−1.6355	0.1020	0.0084	1.2963	0.1949	−0.0034	−1.4873	0.1369

Changes in Performance

As with the Newsweek Green Rankings, I also consider score changes because they provide new information to the market in a way that the actual scores do not. If a firm scores well one year, a similar score the next year does not necessarily provide any new information to the market (although it may if a change is expected or if additional positive/negative press has a reputation impact). I measure abnormal returns and regress changes in performance band since the prior year on abnormal returns, with interactions between performance changes and the time-period dummy variables:

$$(1) \quad \hat{\text{AR}}_{it} = \hat{\beta}_0 + \hat{\beta}_1 d_{t\geq 0} + \hat{\beta}_2 p_{it} + \hat{\beta}_3 (p_{it} \times d_{t\geq 0}) + \hat{\epsilon}_{it}$$

$$(2) \quad \hat{\text{AR}}_{it} = \hat{\beta}_0 + \hat{\beta}_1 d_{t=0} + \hat{\beta}_2 d_{0<t\leq 5} + \hat{\beta}_3 d_{5<t} + \hat{\beta}_4 p_{it} + \hat{\beta}_5 (p_{it} \times d_{t=0}) + \hat{\beta}_6 (p_{it} \times d_{0<t\leq 5}) + \hat{\beta}_7 (p_{it} \times d_{5<t}) + \hat{\epsilon}_{it}$$

where p_{it} is the change in performance band since $t-1$. The sample of firms includes those which received performance ratings in both t and $t-1$. Firm performance is ranked only when disclosure scores are greater than 50.

Change in performance band does not have a statistically significant effect in any time period, providing evidence that wherever investors care about results from the CDP report, they care only about current year results, not changes in performance. The statistically significant but immaterial abnormal returns associated with the $t = 0$ dummy variable in the second specification only show that the average firm that was rated in both the current year and the prior year had slightly negative financial performance when the score was released. Because the sample includes all rated firms, it does not provide any information about the effect of attaining particular performance band or of changes in performance.

Changes in Disclosure Scores

Using an identical methodology to the prior section, I estimate abnormal returns across the sample of firms whose disclosure scores were reported in one year and the prior. I then regress the change in disclosure scores interacted with the time-period dummy variables on abnormal returns. As with the changes in performance band, changes in disclosure score do not have a significant effect in any time period. This supports the previous conclusion that the market does not consider changes since the previous year as a signal of the value of a firm.

Discussion of the CDP Event Studies

Of the CDP event studies, only the A List and non-participation data sets provided significant results. Top performance is recognized with negative abnormal returns, but bottom performance is not recognized by the market. Changes in performance are not associated with abnormal returns. While it is possible that the A List results are specious, the results suggest that investors penalize firms that reduce carbon emissions. This does not mean that the market would not reward environmental performance generally: climate change mitigation is only one aspect environmental performance. Unlike toxics release, chemical pollution, and other highly visible corporate environmental concerns, climate change is a more macro-level problem to which individual firm contributions are neither publicly visible nor, typically, impactful. Also, given that U.S. consumers are more likely to care about

Table 14: Carbon Disclosure Project: Changes since prior year

	Dependent variable: Abnormal Daily Returns			
	Change in Performance Band		Change in Disclosure Score	
$0 \leq t$	−0.00002		−0.0001	
	(0.0001)		(0.0001)	
Change	−0.000	−0.000	−0.000	0.000
	(0.00003)	(0.00003)	(0.00000)	(0.00000)
Change $\times$ $0 \leq t$	0.00000		0.00001	
	(0.0001)		(0.00001)	
$t = 0$		−0.001***		−0.001***
		(0.0004)		(0.0005)
$0 < t \leq 5$		−0.00004		0.00002
		(0.0002)		(0.0002)
$5 < t$		0.0001		0.00001
		(0.0001)		(0.0001)
Change $\times$ $t = 0$		−0.0004		0.00001
		(0.0004)		(0.00004)
Change $\times$ $0 < t \leq 5$		0.00002		−0.00001
		(0.0002)		(0.00002)
Change $\times$ $5 < t$		0.00003		0.00001
		(0.0001)		(0.00001)
Constant	0.000	−0.000	0.000	0.000
	(0.00004)	(0.00004)	(0.00004)	(0.00004)
AR Obs.	153,720	153,720	153,440	153,440
Event Obs.	1,098	1,098	1,096	1,096

Note: *p<0.1; **p<0.05; ***p<0.01

pollution generally than climate change in particular (if they even believe in it), climate change effects may not be an image problem for companies. Thus, carbon emissions are potentially less likely than other environmental concerns to constitute a business, legal, or reputation risk to firms. To illustrate, even in the highly unlikely case that firms are made to pay for their carbon usage, the average firm in the CDP report would only have to pay 0.038% of their market value at current carbon prices.[12] The market may therefore penalize the best emission abatement programs as unnecessary spending, which would explain the negative abnormal returns when abatement efforts are revealed to the market. Even if the best abatement efforts are punished, the worst may not be rewarded if optimal abatement from a business, legal, and reputation perspective lies between the two extremes.

The non-participation event study provides evidence that the firms which do not respond to the CDP survey are viewed as less valuable by the market. As explained above, the negative abnormal returns associated with non-disclosure are not necessarily contradictory with either the bottom performance no-result or the top performance negative abnormal returns. In the event of non-disclosure, the market may assume worst-case performance, which may be worse than the average score in the bottom performance band among disclosed scores. If the market prefers a degree of carbon abatement between best-in-class emissions reductions and the assumed scores when nothing is disclosed, then the market could penalize both top performance and non-participation. It is also theoretically possible that the market assumes that firms which do not disclose their performance are over-abaters; however, the selection of firms which do not disclose suggests that this is not the case.

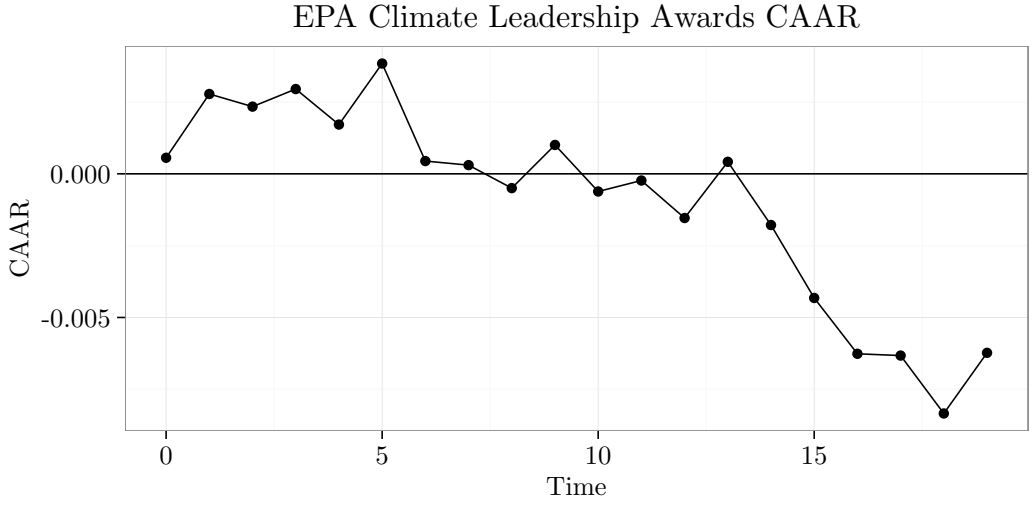
6 Environmental Performance Awards

Environmental performance awards are another potential signal to the markets about firm-level environmental performance. As with the other potential signals considered in this paper, the awards may convey information about actual performance and also serve as a positive shock to firms reputations. Unlike indices and rankings, awards are assigned to only the best firms in a category. Whereas many firms can claim membership to the FTSE4Good index, and whereas rankings also consider firms that did poorly, only one firm can claim title to an award. This could mean that performance signals are "stronger." In this section, I conduct event studies on two prominent sets of environmental awards: the EPA Climate Leadership Awards and the RobecoSAM Yearbook.

6.1 EPA Climate Leadership Awards

Every year since 2012, the EPA and several partners have recognized companies, municipalities, and individuals through their Climate Leadership Awards program. The principal awards are the Organization Leadership Award and the Excellence in Greenhouse Gas Management Award. The latter recognizes several firms for setting targets and several others for achieving them. Some years a Supply Chain Leadership Award is also conferred. All of the awards focus on efforts to reduce greenhouse gas emissions. The awards have been reported on by corporate press releases, sustainable publications, and national and regional media,

[12]The price of carbon is approximated with the most recent auction price of carbon emissions to the power sector in the Northeast and Mid-Atlantic states ($5.25 per ton in March, 2016). The average direct emissions were 3,356,287 tons ($17.6m) for the firms in the 2015 CDP Report. Direct emissions plus power usage were 4,241,317 tons ($22.2m). Average market capitalization was $46.5 billion.
Regional Greenhouse Gas Initiative. (2016). "CO2 Allowances Sold for $5.25 in 31st RGGI Auction."



so it is plausible that the market actors, particularly sustainability-minded ones, would hear about and react to the awards.[13]

Although one might expect a firm's market value to improve slightly when it receives positive press resulting from a well-publicized award recognizing environmental commitments, the event study on the EPA Climate Leadership Awards indicates that those awards have no impact. Cumulative average abnormal returns are not significantly different from zero, with t_{CAAR} never exceeding 0.8. Similarly, the related regressions do not reject the null hypothesis of no effect on any of the time-period dummy variables.

There are a few possible explanations for these results. First, it is possible that investors, SRI or traditional, do not hear about and react to the awards during the post-event window. It is also possible that investors simply do not care about the awards, perhaps because they are indifferent to greenhouse gas emissions and firms' climate change reputations, because they do not view the awards as providing new information, or because they do not think firms' reputations are affected. Finally, it is possible that there is a small effect, which could not be measured given the limited sample size (43 events). The CDP carbon performance event studies provide additional support for the hypothesis that investors do not view greenhouse gas abatement as a valid strategy for reducing business, legal, or reputation risk.

[13]United States Environmental Protection Agency. (2015). "News Releases from Headquarters: UPS, Bank of America, SC Johnson Among 16 Organizations across the U.S. Recognized for Climate Action / EPA also recognizes Chevrolet Clean Energy Campus Campaign, San Diego Regional Climate Collaborative in new Innovative Partnerships Category."

Table 15: EPA Climate Leadership Awards

	Dependent variable:	
	Abnormal Daily Returns	
	(1)	(2)
$0 \leq t$	−0.0003	
	(0.001)	
$t = 0$		0.001
		(0.002)
$0 < t \leq 5$		0.001
		(0.001)
$5 < t$		−0.001
		(0.001)
Constant	0.000	−0.000
	(0.0002)	(0.0002)
AR Obs.	6,020	6,020
Event Obs.	43	43
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 16: EPA Climate Leadership Awards

	EPA CLA ($n = 43$)		
time	CAAR	t_{CAAR}	p
0	0.0006	0.2289	0.8189
1	0.0028	0.8045	0.4211
2	0.0023	0.5528	0.5804
3	0.0030	0.6039	0.5459
4	0.0017	0.3140	0.7535
5	0.0038	0.6417	0.5211
6	0.0004	0.0687	0.9452
7	0.0003	0.0438	0.9651
8	−0.0005	−0.0678	0.9459
9	0.0010	0.1300	0.8965
10	−0.0006	−0.0758	0.9396
11	−0.0002	−0.0275	0.9781
12	−0.0015	−0.1747	0.8613
13	0.0004	0.0457	0.9635
14	−0.0018	−0.1884	0.8506
15	−0.0043	−0.4422	0.6583
16	−0.0063	−0.6219	0.5340
17	−0.0063	−0.6103	0.5416
18	−0.0083	−0.7834	0.4334
19	−0.0062	−0.5703	0.5685

6.2 The RobecoSAM Sustainability Yearbook

RobecoSAM Background & Yearbook Methodology

RobecoSAM is a sustainable investing company that manages assets and helps curate socially responsible indices for Dow Jones and Standard and Poors. Each year, they produce the Sustainability Yearbook to recognize top ESG performance and to inform the SRI community. Inclusion in the Yearbook is based on the same data that inform inclusion in RobecoSAM portfolios and curated indices, so inclusion in the Yearbook may be viewed as a co-signal with other RobecoSAM products.

Performance is measured according to RobecoSAM's "Corporate Sustainability Assessment" (CSA), so it is more likely to provide new information to investors than consolidation of already-public information. The CSA uses a lengthy, industry specific questionnaire to determine corporate governance practices and environmental performance with a particular focus on risk, environmental reporting, eco-efficiency, and corporate citizenship. The CSA is supplemented with data from RepRisk to quantify ESG reputation risk. RobecoSAM's methodology therefore gives weight to the issues that are most relevant to investors. The Yearbook draws from a universe of over 2,000 large public companies that responded to the CSA.[14]

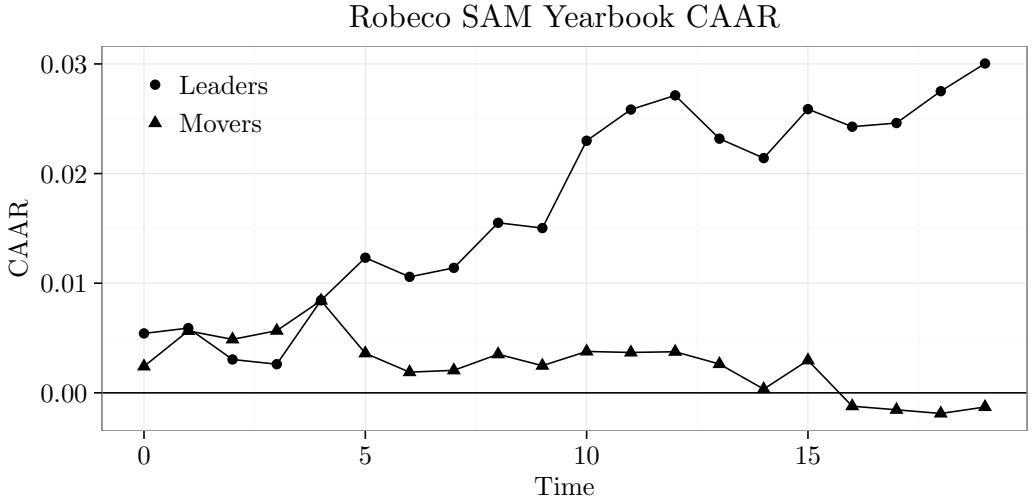
Within each industry classification, RobecoSAM recognizes the firm with the best environmental performance as an industry leader. They also recognize the firm with the greatest improvement in environmental performance as an industry mover. I conduct an event study on the U.S. firms that won each of these awards from 2012 through 2016. In addition to the leader and mover awards, RobecoSAM includes the top 15% of companies in their Yearbook with varying levels of distinction.

Industry Leader Recognition

Recognition as an industry leader is associated with significant, positive abnormal returns. On the day of the event, there is a strongly significant +54bp average abnormal return. This immediately realized effect is persistent at a high level of significance for all but two trading days in the post-event window. The related regression identifies significant abnormal returns associated with each time period dummy variable, except $1 \leq t \leq 5$.

This result strongly suggests that the RobecoSAM industry leader award provides a signal to the financial markets. As with the previous event studies, this effect could be the result of new information about environmental performance, shocks to firm reputation resulting from recognition, or some combination of the two factors. Given the target audience for the RobecoSAM Yearbook, it makes sense that the effect of recognition by RobecoSAM would be greater than the effect of recognition by the EPA or recognition through the rankings studied above. This result does not contradict the CDP A List negative abnormal returns because the two measures of environmental performance focus on different factors. Whereas RobecoSAM focuses on environmental risk and opportunities, CDP focuses exclusively on climate change abatement and carbon emissions. Investors may see environmental risk mitigation as a valid business strategy and also see carbon emissions reductions as a waste.

[14] RobecoSAM. (2015). "RobecoSAM's Corporate Sustainability Assessment Companion."



Industry Mover Recognition

Recognition as an industry mover does not have a significant effect. The CAAR model captures a +56bp cumulative average abnormal return by t_1, which is significant at $p < 0.1$, but no significant CAAR at any other time. The related regression does not reject the null hypothesis of no effect in either specification for any dummy variable.

One possible reason why recognition as an industry mover is not recognized, even though recognition as an industry leader is not, is that investors care more about absolute performance than performance relative to prior years. For example, industry movers may still fail to meet socially responsible investors' ESG criteria. Another possible reason is that industry movers are not recognized with the same prominence in the Yearbook as industry leaders. Whereas each industry leader gets a page describing the firm and a table of leaders is prominently displayed in every year's Yearbook, no edition of the Yearbook gives details on industry movers and only one edition provided a dedicated table of industry movers. Accordingly, it is possible that the market would react to industry movers if only it noticed who they were.

Table 17: Robeco SAM Yearbook

	Dependent variable: AR			
	Leaders		Movers	
$0 \leq t$	0.002^{***}		-0.0001	
	(0.001)		(0.001)	
$t = 0$		0.005^{**}		0.002
		(0.002)		(0.002)
$0 < t \leq 5$		0.001		0.0002
		(0.001)		(0.001)
$5 < t$		0.001^{**}		-0.0003
		(0.001)		(0.001)
Constant	0.000	0.000	0.000	-0.000
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
AR Obs.	5,740	5,740	5,600	5,600
Event Obs.	41	41	40	40
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 18: Robeco SAM Industry Leaders and Movers

	Industry Leaders ($n = 41$)			Industry Movers ($n = 40$)		
time	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p
0	0.0054	2.5344	0.0113	0.0024	1.0535	0.2921
1	0.0059	1.9528	0.0508	0.0057	1.7461	0.0808
2	0.0030	0.8215	0.4114	0.0049	1.2306	0.2185
3	0.0026	0.6107	0.5414	0.0057	1.2391	0.2153
4	0.0084	1.7651	0.0776	0.0084	1.6443	0.1001
5	0.0123	2.3527	0.0186	0.0036	0.6435	0.5199
6	0.0106	1.8695	0.0616	0.0019	0.3120	0.7550
7	0.0114	1.8847	0.0595	0.0021	0.3175	0.7509
8	0.0155	2.4176	0.0156	0.0035	0.5129	0.6080
9	0.0150	2.2223	0.0263	0.0025	0.3423	0.7321
10	0.0230	3.2415	0.0012	0.0038	0.4975	0.6188
11	0.0258	3.4879	0.0005	0.0037	0.4647	0.6421
12	0.0271	3.5185	0.0004	0.0037	0.4543	0.6496
13	0.0232	2.8974	0.0038	0.0026	0.3069	0.7589
14	0.0214	2.5853	0.0097	0.0003	0.0387	0.9692
15	0.0259	3.0253	0.0025	0.0030	0.3239	0.7460
16	0.0243	2.7528	0.0059	-0.0012	-0.1290	0.8973
17	0.0246	2.7124	0.0067	-0.0015	-0.1592	0.8735
18	0.0275	2.9518	0.0032	-0.0019	-0.1887	0.8503
19	0.0300	3.1409	0.0017	-0.0013	-0.1262	0.8996

7 Discussion of Results

In this essay, I have examined three related categories of information regarding CSR performance: SRI indices, green rankings, and environmental performance awards. Each of these sources could reasonably be hypothesized to supply the market with a signal about firms' actual environmental performance as well as with a shock to their reputation. Both of these signals would result in abnormal returns if they provide meaningful, unanticipated information that is realized by investors during the twenty day post-event window.

The event studies regarding the FTSE4Good Global Index show that addition to the index is not perceived as new information about firm value, but that exclusion from the index results in significant negative abnormal returns when the change is announced and at many points in the post-event period. This significance is particularly strong when the report that was released during the trough of the financial crisis is excluded. For both addition and exclusion, there is no effect when the changes are actually executed, only when they are announced, indicating that the effect is through new information not passive tracking of the index.

I also consider two sets of green rankings: the Newsweek Green Rankings and the Carbon Disclosure Project ratings of the S&P 500. For the Newsweek Green Rankings, ranking in the top ten or bottom ten does not have a significant impact on abnormal returns, although there is weak evidence that lower rankings are associated with negative abnormal returns on the day the rankings are released. Changes in ranking in either direction are associated with positive abnormal returns, but the two time series of CAAR are not significantly different from one another, indicating that changes in ranking have no actual effect. For the Carbon Disclosure Project, top performance and non-participation are associated with negative abnormal returns, while bottom performance, changes in performance, and changes in disclosure do not result in a significant effect.

Of the environmental performance awards event studies, only the RobecoSAM Leaders award indicates significant abnormal returns. The EPA Climate Leadership Awards, which recognize greenhouse gas abatement efforts, could be insignificant because they are a new awards series so the sample size is small, or because investors do not reward greenhouse gas abatement. While recognition in the RobecoSAM Yearbook as an industry leader results in significant, material abnormal returns (+3% in the post-event window), recognition as an industry mover was not significant. This could be an indication of the relevance of top performance versus performance gains, or of the relative prominence of the leaders awards in the Yearbook and subsequent media reporting.

Taken together, these results provide mixed evidence for the direction and significance of environmental performance on abnormal returns. The sources of information which would be considered positive from an environmental perspective (FTSE4Good additions, high rankings, improvements in rankings, and awards) do not always result in positive financial performance. Of those that demonstrated a significant effect, one showed positive abnormal returns (RobecoSAM Leaders) and one showed negative abnormal returns (CDP A List). The difference might be explained by the fact that the former focuses on environmental data with more obvious business implications than the latter, which focuses on carbon emissions only. The lack of significance in the other positive signal event studies provide preliminary evidence that the effect is not consistent across roughly similar data sources. Additionally, there is a weak association between higher rankings in the Newsweek Green Rankings and higher abnormal returns on the day the report is released.

The sources of information which would be considered negative from an environmental

perspective (FTSE4Good deletion, low rankings, declines in rank, CDP non-disclosure) provide slightly more consistent evidence in that (cumulative) abnormal returns are negative wherever they are significant. Deletion from the FTSE4Good index and non-disclosure of carbon emissions and abatement programs to the CDP result in statistically significant negative abnormal returns. Bottom rankings in the Newsweek Green Rankings and the CDP report are not significant, but there is weak evidence that lower Newsweek Green Rankings are associated with lower abnormal returns on the day the report is released. Declines in ranking are not significant for either set of rankings.

Table 19: Summary of Results

	Events	AAR_0	p	$CAAR_4$	p	$CAAR_{19}$	p	$d_{0<t\leq 5}$	p	$d_{5<t}$	p
FTSE Additions											
Announcements	129	−0.0019	0.14	−0.0022	0.44	0.0014	0.81	0.0000	0.96	0.0002	0.54
Announcements ex. 03/09	128	−0.0020	0.13	−0.0022	0.46	0.0018	0.75	0.0000	0.94	0.0003	0.48
Executed	129	−0.0006	0.66	−0.0007	0.80	0.0005	0.92	0.0002	0.69	−0.0000	0.99
FTSE Deletions											
Announcements	99	−0.0040	0.02	−0.0029	0.45	−0.0128	0.10	−0.0003	0.67	−0.0005	0.29
Announcements ex. 03/09	94	−0.0044	0.01	−0.0045	0.21	−0.0177	0.01	−0.0006	0.39	−0.0007	0.12
Executed	99	0.0007	0.67	0.0039	0.31	0.0028	0.72	−0.0005	0.54	0.0003	0.52
Newsweek Rankings											
Top 10	45	−0.0008	0.77	−0.0053	0.36	0.0040	0.73	−0.0006	0.58	0.0006	0.43
Bottom 10	104	−0.0001	0.97	0.0006	0.86	0.0004	0.95	0.0003	0.61	−0.0001	0.83
Rank*	2,287	−0.0000	0.06					0.0000	0.75	0.0000	0.27
Rank difference	781	−0.0004	0.71	−0.0027	0.57	0.0005	0.98				
CDP											
A list	149	−0.0033	0.00	−0.0029	0.17	−0.0070	0.10	0.0003	0.46	−0.0004	0.16
Bottom performance	93	−0.0021	0.14	−0.0019	0.55	0.0084	0.19	0.0001	0.89	0.0007	0.08
Non-participation	881	0.0004	0.45	−0.0050	0.00	−0.0034	0.14	−0.0013	0.00	0.0002	0.17
ΔPerformance*	1,098	−0.0004	0.28					0.0000	0.90	0.0000	0.80
ΔDisclosure*	1,096	0.0001	0.15					−0.0000	0.62	0.0000	0.73
EPA CLA	43	0.0006	0.82	0.0017	0.75	−0.0062	0.57	0.0007	0.54	−0.0007	0.28
RobecoSAM											
Leaders	41	0.0054	0.01	0.0084	0.08	0.0300	0.00	0.0014	0.17	0.0013	0.04
Movers	40	0.0024	0.29	0.0084	0.10	−0.0013	0.90	0.0002	0.82	−0.0003	0.59

Note: * AAR_0 is the regression $t = 0$ dummy variable.

Appendix A Meta-Analysis

In this essay, I have conducted many event studies, several of which yielded statistically significant results. Of course, even if the true value of abnormal returns is zero in all of the event studies, some may appear significant by virtue of the number of studies conducted. Twenty one event studies were presented in this essay, so if the true value of all abnormal returns were zero, there would be one false rejection of the null hypothesis (type I error) at the 5% significance level on average. Average abnormal returns on the event date (where most of the effect should be captured) were significant below the 5% level in four event studies, indicating that this essay has probably examined more than random noise. In order to test whether or not the event studies considered together constitute a statistically significant result, I conduct a meta-analysis based on the methodology developed by Hedges and Olkin (1985).

I begin the meta-analysis by calculating Hedges' g for each event study in order to standardize the effect size. Hedges' unbiased g as applied to t_{CAAR} is the test statistic corrected for a small-sample bias (N is the number of event observations):

$$g = (1 - \frac{3}{4n - 9})t_{\text{CAAR}}$$

With variance (Hedges, 1985:86):

$$\sigma^2(g) = \frac{n}{n-1} + \frac{g^2}{2n}$$

Two tests are conducted on Hedges' g. First, a test on homogeneity is conducted to see if the standardized effect sizes are drawn from the same population, which is necessary to make sense of the overall results. Following Hedges and Olkin, the test statistic is calculated using the the total weights of the event studies (reciprocal of variance), the total weighted g, and the total weighted g^2. These are abbreviated TW, TWD, TWDS, respectively. and The test statistic is distributed chi-squared with degrees of freedom equal to the number of event studies less one:

$$\text{TW} = \sum \frac{1}{\sigma^2(g)}$$
$$\text{TWD} = \sum \frac{g}{\sigma^2(g)}$$
$$\text{TWDS} = \sum \frac{g^2}{\sigma^2(g)}$$

$$t_h = \text{TWDS} - \frac{\text{TWD}^2}{\text{TW}}$$

Second, a test on the significance of the effect size is calculated against the null hypothesis that the population effect size is zero. This test statistic is normally distributed and calculated according to the effect size estimate (D) and its standard error. Note that D represents the number of standard deviations between the distributions of normal and abnormal returns, not AAR or CAAR.

$$D = \frac{\text{TWD}}{\text{TW}}$$
$$t_s = \frac{\text{TWD}}{\sqrt{\text{TW}}}$$

I conduct this style of meta-analysis on the average abnormal returns on the day of the event, the cumulative average abnormal returns five days following the event, and the cumulative average abnormal returns and the end of the post-event window (t_{19}). I do this for all of the event studies for which cumulative abnormal returns were calculated (i.e. excluding those on which regressions on periodic abnormal returns were performed instead). I also exclude the FTSE4Good additions specification that excluded March 2009, because it is essentially identical to the version with 2009 (only one observation is excluded). For all sources of news that are negative from a CSR perspective, the effect is multiplied by -1 when combined with positive news, under the assumption that positive and negative signals are symmetrical. Seven positive sources of news are included in the meta-analysis: additions to the FTSE4Good index (announcement and execution), Newsweek Green Rankings Top 10, Carbon Disclosure Project A List, EPA Climate Leadership Awards, RobecoSAM Leaders, and RobecoSAM Movers. Six negative sources of news are included and inverted: deletion from the FTSE4Good Index (announcement, announcement excluding March 2009, and execution), Newsweek Green Rankings Bottom 10, Carbon Disclosure Project bottom performance, and Carbon Disclosure Project non-participation.

A meta-analysis of this kind would be invalidated if insignificant results were excluded from the paper (the "file-drawer problem"). While I did test a small number of alternative specifications (e.g. top quintile rank instead of top ten rank), the decision whether or not to include a given specification was driven by reasonableness of the model, not statistical significance. In the case of top quintile ranking, for example, the specification was changed to reflect the intuition that rankings in the top ten are more important that others in the top quintile, because top ten lists receive media attention. Neither specification was statistically significant. Other event studies tangentially related to this essay were also tested, but excluded as irrelevant and would therefore not be a meaningful addition to the meta-analysis. Excluded event studies include: a test of the effect of the publication of the most cited papers related to climate change on oil and gas companies (no effect on a small sample), a test of the effect of environmental disasters on third-party firms in the same industry (no effect on a small sample), and a test of the impact of U.S. Department of Justice fines following environmental disasters (spike in volatility, no significant change in means on a small sample).

Table 20: Meta-Analysis Results

	AAR_0	$CAAR_4$	$CAAR_{19}$
Positive News ($n = 7$)			
Homogeneity Test	19.7688	8.5821	11.2424
Significance Test	−0.7579	0.0933	0.4172
Significance P Value	0.4485	0.9257	0.6766
Effect Size Estimator	−0.2916	0.0358	0.1603
Negative News ($n = 6$)			
Homogeneity Test	10.4968	17.0040	9.8861
Significance Test	−2.0981	−2.3411	−1.5454
Significance P Value	0.0359	0.0192	0.1222
Effect Size Estimator	−0.8658	−0.9623	−0.6366
All News ($n = 13$)			
Homogeneity Test	34.4737	28.3028	21.8432
Significance Test	0.8765	1.6652	1.3593
Significance P Value	0.3808	0.0959	0.1741
Effect Size Estimator	0.2467	0.4669	0.3820

For the event studies of positive environmental news, the critical value of the chi-squared distribution at $df = 6$ is 12.6 at a Type II error rate of 0.05. So, the null hypothesis that the underlying effect sizes is the same across the sample is rejected at AAR_0, but not for $CAAR_4$ or $CAAR_{19}$. This indicates that only the latter two intervals are meaningful. For those two specifications, the effect size is positive, but not significantly different from zero. This implies that when all of the sources of positive news are considered to be the same kind of news, the signal does not impact share prices. However, there is reason to believe that not all positive sources of information are equal. As already discussed, the content of the news is often different (e.g. CDP reports carbon performance, RobecoSAM reports environmental performance more generally), the audience is often different (e.g. Newsweek primarily targets consumers, FTSE targets investors), and the quality of the signal as interpreted by the market is different (e.g. RobecoSAM may have a better reputation than Newsweek among investors). This potential heterogeneity means that the individual results should not be discarded even though the aggregate is insignificant.

For the event studies of negative environmental news, there are five degrees of freedom, so the critical value is 11.1 at a Type II error rate of 0.05. At that level the null hypothesis of homogeneity is rejected only for the $CAAR_4$ interval. A negative effect size is estimated in all specifications, and is significant on the event date and a five day interval. As with the positive news, there is reason to doubt that all of the event studies considered here measure the same kind of thing, so the individual specifications are also meaningful. Still, the aggregate result confirms that the significance of certain of the individual results is not spurious.

When all of the news is aggregate, an aggregate effect size is estimated in the direction one would expect, although it only significant at $CAAR_4$, and then only weakly so. With twelve degrees of freedom, the critical value is 21.0 at 0.05, meaning that the null hypothesis of homogeneity is rejected on all specifications. This is consistent with the view that the market regards certain environmental signals as different than others, and that positive and negative signals are not received symmetrically by the market.

Appendix B All Tables and Regression Results

Table 21: Summary of Results

	Events	AAR_0	p	$CAAR_4$	p	$CAAR_{19}$	p	$d_{0<t\leq 5}$	p	$d_{5<t}$	p
FTSE Additions											
Announcements	129	−0.0019	0.14	−0.0022	0.44	0.0014	0.81	0.0000	0.96	0.0002	0.54
Announcements ex. 03/09	128	−0.0020	0.13	−0.0022	0.46	0.0018	0.75	0.0000	0.94	0.0003	0.48
Executed	129	−0.0006	0.66	−0.0007	0.80	0.0005	0.92	0.0002	0.69	−0.0000	0.99
FTSE Deletions											
Announcements	99	−0.0040	0.02	−0.0029	0.45	−0.0128	0.10	−0.0003	0.67	−0.0005	0.29
Announcements ex. 03/09	94	−0.0044	0.01	−0.0045	0.21	−0.0177	0.01	−0.0006	0.39	−0.0007	0.12
Executed	99	0.0007	0.67	0.0039	0.31	0.0028	0.72	−0.0005	0.54	0.0003	0.52
Newsweek Rankings											
Top 10	45	−0.0008	0.77	−0.0053	0.36	0.0040	0.73	−0.0006	0.58	0.0006	0.43
Bottom 10	104	−0.0001	0.97	0.0006	0.86	0.0004	0.95	0.0003	0.61	−0.0001	0.83
Rank*	2,287	−0.0000	0.06					0.0000	0.75	0.0000	0.27
Rank difference	781	−0.0004	0.71	−0.0027	0.57	0.0005	0.98				
CDP											
A list	149	−0.0033	0.00	−0.0029	0.17	−0.0070	0.10	0.0003	0.46	−0.0004	0.16
Bottom performance	93	−0.0021	0.14	−0.0019	0.55	0.0084	0.19	0.0001	0.89	0.0007	0.08
Non-participation	881	0.0004	0.45	−0.0050	0.00	−0.0034	0.14	−0.0013	0.00	0.0002	0.17
ΔPerformance*	1,098	−0.0004	0.28					0.0000	0.90	0.0000	0.80
ΔDisclosure*	1,096	0.0001	0.15					−0.0000	0.62	0.0000	0.73
EPA CLA	43	0.0006	0.82	0.0017	0.75	−0.0062	0.57	0.0007	0.54	−0.0007	0.28
RobecoSAM											
Leaders	41	0.0054	0.01	0.0084	0.08	0.0300	0.00	0.0014	0.17	0.0013	0.04
Movers	40	0.0024	0.29	0.0084	0.10	−0.0013	0.90	0.0002	0.82	−0.0003	0.59

Note: * AAR_0 is the regression $t = 0$ dummy variable.

Table 22: Deepwater Horizon Disaster

	Explosion ($n = 3$)			Obama Press Conf. ($n = 3$)		
time	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p
0	−0.0125	−1.7717	0.0765	−0.0826	−11.9273	0.0000
1	−0.0147	−1.4804	0.1388	−0.1137	−11.6054	0.0000
2	−0.0202	−1.6553	0.0979	−0.1300	−10.8407	0.0000
3	−0.0360	−2.5636	0.0104	−0.0891	−6.4329	0.0000
4	−0.0403	−2.5622	0.0104	−0.0938	−6.0562	0.0000
5	−0.0409	−2.3740	0.0176	−0.0723	−4.2644	0.0000
6	−0.1242	−6.6757	0.0000	−0.0785	−4.2864	0.0000
7	−0.1557	−7.8291	0.0000	−0.1540	−7.8601	0.0000
8	−0.1727	−8.1902	0.0000	−0.1461	−7.0328	0.0000
9	−0.1322	−5.9461	0.0000	−0.1620	−7.3963	0.0000
10	−0.1374	−5.8929	0.0000	−0.1493	−6.4979	0.0000
11	−0.1163	−4.7746	0.0000	−0.1364	−5.6844	0.0000
12	−0.1229	−4.8499	0.0000	−0.1465	−5.8651	0.0000
13	−0.1993	−7.5764	0.0000	−0.1417	−5.4698	0.0000
14	−0.1920	−7.0517	0.0000	−0.1414	−5.2721	0.0000
15	−0.2086	−7.4165	0.0000	−0.1384	−4.9949	0.0000
16	−0.1963	−6.7726	0.0000	−0.1466	−5.1336	0.0000
17	−0.1839	−6.1643	0.0000	−0.1831	−6.2309	0.0000
18	−0.1945	−6.3482	0.0000	−0.1596	−5.2875	0.0000
19	−0.1903	−6.0522	0.0000	−0.1404	−4.5348	0.0000

Table 23: FTSE4Good Additions

	Announced ($n = 129$)			Announced ex. 03/09 ($n = 128$)			Executed ($n = 129$)		
time	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p
0	−0.0019	−1.4811	0.1386	−0.0020	−1.5213	0.1282	−0.0006	−0.4367	0.6623
1	−0.0036	−1.9580	0.0502	−0.0036	−1.9316	0.0534	−0.0033	−1.8279	0.0676
2	−0.0035	−1.5779	0.1146	−0.0035	−1.5692	0.1166	−0.0018	−0.8135	0.4159
3	−0.0031	−1.1771	0.2391	−0.0030	−1.1584	0.2467	−0.0016	−0.6178	0.5367
4	−0.0022	−0.7673	0.4429	−0.0022	−0.7397	0.4595	−0.0007	−0.2563	0.7977
5	−0.0018	−0.5579	0.5769	−0.0018	−0.5519	0.5810	0.0006	0.1923	0.8475
6	−0.0002	−0.0551	0.9561	−0.0002	−0.0449	0.9642	0.0012	0.3582	0.7202
7	0.0001	0.0392	0.9688	0.0001	0.0257	0.9795	0.0009	0.2349	0.8143
8	−0.0014	−0.3517	0.7250	−0.0013	−0.3332	0.7390	0.0012	0.3195	0.7494
9	−0.0011	−0.2627	0.7928	−0.0011	−0.2676	0.7890	−0.0000	−0.0112	0.9910
10	0.0001	0.0230	0.9816	0.0001	0.0176	0.9860	−0.0001	−0.0163	0.9870
11	−0.0014	−0.3025	0.7623	−0.0013	−0.2886	0.7729	−0.0009	−0.2111	0.8328
12	0.0006	0.1261	0.8997	0.0007	0.1502	0.8806	−0.0013	−0.2765	0.7822
13	0.0022	0.4623	0.6438	0.0022	0.4458	0.6557	−0.0006	−0.1249	0.9006
14	0.0018	0.3616	0.7177	0.0018	0.3632	0.7164	0.0011	0.2218	0.8245
15	0.0024	0.4602	0.6453	0.0025	0.4728	0.6364	−0.0036	−0.6897	0.4904
16	0.0011	0.2077	0.8354	0.0013	0.2438	0.8074	−0.0022	−0.4067	0.6842
17	0.0006	0.1099	0.9125	0.0009	0.1644	0.8694	0.0003	0.0476	0.9621
18	0.0020	0.3524	0.7245	0.0024	0.4287	0.6682	0.0020	0.3483	0.7276
19	0.0014	0.2340	0.8150	0.0018	0.3167	0.7515	0.0005	0.0943	0.9248

Table 24: FTSE4Good Deletions

	Announced ($n = 99$)			Announced ex. 03/09 ($n = 94$)			Executed ($n = 99$)		
time	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p
0	−0.0040	−2.3091	0.0209	−0.0044	−2.7252	0.0064	0.0007	0.4291	0.6679
1	−0.0034	−1.3812	0.1672	−0.0048	−2.0921	0.0364	0.0004	0.1724	0.8631
2	−0.0056	−1.8733	0.0610	−0.0065	−2.3171	0.0205	0.0022	0.7250	0.4684
3	−0.0044	−1.2899	0.1971	−0.0056	−1.7201	0.0854	0.0040	1.1490	0.2506
4	−0.0029	−0.7521	0.4520	−0.0045	−1.2516	0.2107	0.0039	1.0216	0.3070
5	−0.0056	−1.3389	0.1806	−0.0076	−1.9182	0.0551	−0.0017	−0.3971	0.6913
6	−0.0065	−1.4319	0.1522	−0.0084	−1.9621	0.0498	0.0010	0.2117	0.8324
7	−0.0084	−1.7217	0.0851	−0.0100	−2.1806	0.0292	−0.0007	−0.1453	0.8845
8	−0.0059	−1.1375	0.2553	−0.0092	−1.8883	0.0590	0.0042	0.8073	0.4195
9	−0.0042	−0.7661	0.4436	−0.0075	−1.4724	0.1409	0.0046	0.8497	0.3955
10	−0.0046	−0.8096	0.4182	−0.0073	−1.3516	0.1765	0.0037	0.6451	0.5189
11	−0.0022	−0.3783	0.7052	−0.0065	−1.1662	0.2435	−0.0009	−0.1498	0.8809
12	−0.0056	−0.9093	0.3632	−0.0090	−1.5437	0.1227	0.0000	0.0052	0.9958
13	−0.0109	−1.7005	0.0890	−0.0127	−2.0970	0.0360	0.0007	0.1047	0.9166
14	−0.0075	−1.1270	0.2597	−0.0103	−1.6389	0.1012	−0.0001	−0.0221	0.9824
15	−0.0101	−1.4747	0.1403	−0.0125	−1.9388	0.0525	−0.0050	−0.7215	0.4706
16	−0.0073	−1.0274	0.3042	−0.0120	−1.7982	0.0721	−0.0026	−0.3591	0.7195
17	−0.0055	−0.7563	0.4495	−0.0118	−1.7166	0.0861	−0.0007	−0.0987	0.9213
18	−0.0094	−1.2571	0.2087	−0.0150	−2.1260	0.0335	0.0028	0.3747	0.7079
19	−0.0128	−1.6695	0.0950	−0.0177	−2.4444	0.0145	0.0028	0.3601	0.7188

Table 25: Newsweek Green Rankings

	Top 10 Rank ($n = 45$)			Bottom 10 Rank ($n = 104$)		
time	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p
0	−0.0008	−0.2949	0.7681	−0.0001	−0.0364	0.9710
1	0.0003	0.0695	0.9446	0.0030	1.4134	0.1575
2	−0.0012	−0.2773	0.7815	0.0025	0.9501	0.3421
3	−0.0053	−1.0326	0.3018	−0.0002	−0.0633	0.9496
4	−0.0053	−0.9142	0.3606	0.0006	0.1800	0.8572
5	−0.0040	−0.6239	0.5327	0.0016	0.4458	0.6557
6	−0.0025	−0.3618	0.7175	0.0014	0.3466	0.7289
7	−0.0054	−0.7398	0.4594	0.0018	0.4249	0.6709
8	−0.0043	−0.5478	0.5838	0.0035	0.7728	0.4396
9	0.0016	0.1900	0.8493	0.0020	0.4097	0.6820
10	0.0008	0.0951	0.9242	−0.0030	−0.6048	0.5453
11	0.0021	0.2342	0.8149	−0.0022	−0.4239	0.6717
12	0.0019	0.2067	0.8362	−0.0030	−0.5431	0.5871
13	0.0029	0.2978	0.7659	−0.0019	−0.3390	0.7346
14	0.0027	0.2700	0.7872	−0.0010	−0.1733	0.8624
15	0.0054	0.5211	0.6023	−0.0015	−0.2469	0.8050
16	0.0089	0.8328	0.4050	−0.0003	−0.0491	0.9608
17	0.0060	0.5474	0.5841	0.0019	0.2947	0.7682
18	0.0077	0.6791	0.4971	0.0049	0.7408	0.4588
19	0.0040	0.3428	0.7318	0.0004	0.0617	0.9508

Table 26: Newsweek Green Rankings

	Up in Rank ($n = 781$)			Down in Rank ($n = 831$)			Difference		
time	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p
0	−0.0009	−1.8283	0.0675	−0.0005	−1.0424	0.2972	−0.0004	−0.3705	0.7110
1	0.0008	1.2172	0.2235	0.0023	3.2658	0.0011	−0.0014	−0.7491	0.4538
2	−0.0000	−0.0601	0.9521	0.0019	2.2978	0.0216	−0.0020	−0.6908	0.4897
3	−0.0009	−0.9402	0.3471	0.0021	2.1283	0.0333	−0.0030	−0.7718	0.4402
4	−0.0010	−0.9240	0.3555	0.0018	1.6065	0.1082	−0.0027	−0.5682	0.5699
5	0.0019	1.6717	0.0946	0.0044	3.6553	0.0003	−0.0024	−0.4219	0.6731
6	0.0035	2.7905	0.0053	0.0052	3.9825	0.0001	−0.0017	−0.2453	0.8062
7	0.0045	3.3386	0.0008	0.0050	3.6118	0.0003	−0.0005	−0.0675	0.9461
8	0.0043	3.0521	0.0023	0.0062	4.2192	0.0000	−0.0019	−0.2135	0.8309
9	0.0053	3.5043	0.0005	0.0069	4.4832	0.0000	−0.0017	−0.1745	0.8614
10	0.0084	5.3282	0.0000	0.0077	4.7191	0.0000	0.0007	0.0681	0.9457
11	0.0100	6.0758	0.0000	0.0084	4.9716	0.0000	0.0016	0.1344	0.8931
12	0.0083	4.8503	0.0000	0.0088	5.0094	0.0000	−0.0005	−0.0435	0.9653
13	0.0070	3.9203	0.0001	0.0082	4.4612	0.0000	−0.0012	−0.0898	0.9284
14	0.0077	4.2172	0.0000	0.0092	4.8718	0.0000	−0.0015	−0.1029	0.9181
15	0.0081	4.2935	0.0000	0.0077	3.9069	0.0001	0.0005	0.0323	0.9743
16	0.0083	4.2236	0.0000	0.0077	3.8260	0.0001	0.0005	0.0329	0.9737
17	0.0091	4.5055	0.0000	0.0075	3.6039	0.0003	0.0016	0.0913	0.9273
18	0.0070	3.3817	0.0007	0.0069	3.2133	0.0013	0.0001	0.0075	0.9940
19	0.0064	3.0212	0.0025	0.0059	2.6944	0.0071	0.0005	0.0265	0.9788

Table 27: Carbon Disclosure Project

	A List ($n = 149$)			Bottom Performance ($n = 93$)			Non-Participation ($n = 881$)		
time	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p
0	−0.0033	−3.4487	0.0006	−0.0021	−1.4852	0.1375	0.0004	0.7575	0.4487
1	−0.0030	−2.2320	0.0256	−0.0031	−1.5304	0.1259	−0.0028	−3.8986	0.0001
2	−0.0040	−2.4012	0.0163	−0.0013	−0.5169	0.6052	−0.0030	−3.3559	0.0008
3	−0.0042	−2.2043	0.0275	−0.0021	−0.7126	0.4761	−0.0044	−4.3531	0.0000
4	−0.0029	−1.3567	0.1749	−0.0019	−0.5909	0.5546	−0.0050	−4.3935	0.0000
5	−0.0017	−0.7124	0.4762	−0.0017	−0.4725	0.6365	−0.0061	−4.9395	0.0000
6	−0.0018	−0.6991	0.4845	0.0008	0.2041	0.8383	−0.0069	−5.1626	0.0000
7	−0.0027	−1.0086	0.3132	0.0020	0.4801	0.6312	−0.0068	−4.7527	0.0000
8	−0.0017	−0.6075	0.5435	0.0024	0.5441	0.5864	−0.0069	−4.5550	0.0000
9	−0.0028	−0.9420	0.3462	0.0012	0.2649	0.7911	−0.0078	−4.8486	0.0000
10	−0.0043	−1.3607	0.1736	0.0005	0.1016	0.9190	−0.0083	−4.9146	0.0000
11	−0.0030	−0.9171	0.3591	0.0015	0.3054	0.7601	−0.0081	−4.6001	0.0000
12	−0.0049	−1.4351	0.1513	0.0041	0.7808	0.4349	−0.0077	−4.2017	0.0000
13	−0.0059	−1.6444	0.1001	0.0045	0.8231	0.4105	−0.0061	−3.2098	0.0013
14	−0.0046	−1.2369	0.2161	0.0038	0.6837	0.4941	−0.0052	−2.6393	0.0083
15	−0.0036	−0.9517	0.3413	0.0035	0.6090	0.5425	−0.0043	−2.1023	0.0355
16	−0.0044	−1.1087	0.2676	0.0057	0.9492	0.3425	−0.0032	−1.5104	0.1309
17	−0.0026	−0.6351	0.5253	0.0088	1.4309	0.1525	−0.0015	−0.7073	0.4794
18	−0.0043	−1.0252	0.3053	0.0094	1.4911	0.1359	−0.0032	−1.4347	0.1514
19	−0.0070	−1.6355	0.1020	0.0084	1.2963	0.1949	−0.0034	−1.4873	0.1369

Table 28: EPA Climate Leadership Awards

	EPA CLA ($n = 43$)		
time	CAAR	t_{CAAR}	p
0	0.0006	0.2289	0.8189
1	0.0028	0.8045	0.4211
2	0.0023	0.5528	0.5804
3	0.0030	0.6039	0.5459
4	0.0017	0.3140	0.7535
5	0.0038	0.6417	0.5211
6	0.0004	0.0687	0.9452
7	0.0003	0.0438	0.9651
8	−0.0005	−0.0678	0.9459
9	0.0010	0.1300	0.8965
10	−0.0006	−0.0758	0.9396
11	−0.0002	−0.0275	0.9781
12	−0.0015	−0.1747	0.8613
13	0.0004	0.0457	0.9635
14	−0.0018	−0.1884	0.8506
15	−0.0043	−0.4422	0.6583
16	−0.0063	−0.6219	0.5340
17	−0.0063	−0.6103	0.5416
18	−0.0083	−0.7834	0.4334
19	−0.0062	−0.5703	0.5685

Table 29: Robeco SAM Industry Leaders and Movers

	Industry Leaders ($n = 41$)			Industry Movers ($n = 40$)		
time	CAAR	t_{CAAR}	p	CAAR	t_{CAAR}	p
0	0.0054	2.5344	0.0113	0.0024	1.0535	0.2921
1	0.0059	1.9528	0.0508	0.0057	1.7461	0.0808
2	0.0030	0.8215	0.4114	0.0049	1.2306	0.2185
3	0.0026	0.6107	0.5414	0.0057	1.2391	0.2153
4	0.0084	1.7651	0.0776	0.0084	1.6443	0.1001
5	0.0123	2.3527	0.0186	0.0036	0.6435	0.5199
6	0.0106	1.8695	0.0616	0.0019	0.3120	0.7550
7	0.0114	1.8847	0.0595	0.0021	0.3175	0.7509
8	0.0155	2.4176	0.0156	0.0035	0.5129	0.6080
9	0.0150	2.2223	0.0263	0.0025	0.3423	0.7321
10	0.0230	3.2415	0.0012	0.0038	0.4975	0.6188
11	0.0258	3.4879	0.0005	0.0037	0.4647	0.6421
12	0.0271	3.5185	0.0004	0.0037	0.4543	0.6496
13	0.0232	2.8974	0.0038	0.0026	0.3069	0.7589
14	0.0214	2.5853	0.0097	0.0003	0.0387	0.9692
15	0.0259	3.0253	0.0025	0.0030	0.3239	0.7460
16	0.0243	2.7528	0.0059	−0.0012	−0.1290	0.8973
17	0.0246	2.7124	0.0067	−0.0015	−0.1592	0.8735
18	0.0275	2.9518	0.0032	−0.0019	−0.1887	0.8503
19	0.0300	3.1409	0.0017	−0.0013	−0.1262	0.8996

Table 30: Deepwater Horizon

	Dependent variable: Abnormal Daily Returns			
	Explosion		Obama Press Conf.	
$0 \leq t$	-0.010^{***}		-0.007^{***}	
	(0.002)		(0.002)	
$t = 0$		-0.012		-0.083^{***}
		(0.010)		(0.009)
$0 < t \leq 5$		-0.006		0.002
		(0.004)		(0.004)
$5 < t$		-0.011^{***}		-0.005^{*}
		(0.003)		(0.003)
Constant	-0.000	-0.000	-0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
AR Obs.	420	420	420	420
Event Obs.	3	3	3	3
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 31: FTSE4Good Additions

	Dependent variable: Abnormal Daily Returns					
	Announced		Announced (ex. 03/09)		Executed	
$0 \leq t$	0.0001		0.0001		0.00003	
	(0.0003)		(0.0003)		(0.0003)	
$t = 0$		-0.002		-0.002		-0.001
		(0.001)		(0.001)		(0.001)
$0 < t \leq 5$		0.00003		0.00004		0.0002
		(0.001)		(0.001)		(0.001)
$5 < t$		0.0002		0.0003		-0.00000
		(0.0004)		(0.0004)		(0.0004)
Constant	0.000	0.000	0.000	0.000	0.000	0.000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
AR Obs.	18,060	18,060	17,920	17,920	18,060	18,060
Event Obs.	129	129	128	128	129	129
Note:						*p<0.1; **p<0.05; ***p<0.01

Table 32: FTSE4Good Deletions

	Dependent variable: Abnormal Daily Returns					
	Announced		Announced (ex. 03/09)		Executed	
$0 \leq t$	-0.001		-0.001^{**}		0.0001	
	(0.0004)		(0.0004)		(0.0004)	
$t = 0$		-0.004^{**}		-0.004^{***}		0.001
		(0.002)		(0.002)		(0.002)
$0 < t \leq 5$		-0.0003		-0.001		-0.0005
		(0.001)		(0.001)		(0.001)
$5 < t$		-0.001		-0.001		0.0003
		(0.0005)		(0.0005)		(0.0005)
Constant	-0.000	0.000	0.000	0.000	0.000	-0.000
	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0002)	(0.0002)
AR Obs.	13,860	13,860	13,160	13,160	13,860	13,860
Event Obs.	99	99	94	94	99	99
Note:						*p<0.1; **p<0.05; ***p<0.01

Table 33: Newsweek Green Rankings

	Dependent variable: Abnormal Daily Returns			
	Top 10 Rank		Bottom 10 Rank	
$0 \leq t$	0.0002		0.00002	
	(0.001)		(0.0004)	
$t = 0$		-0.001		-0.0001
		(0.003)		(0.001)
$0 < t \leq 5$		-0.001		0.0003
		(0.001)		(0.001)
$5 < t$		0.001		-0.0001
		(0.001)		(0.0004)
Constant	0.000	0.000	0.000	-0.000
	(0.0002)	(0.0002)	(0.0001)	(0.0001)
AR Obs.	6,300	6,300	14,560	14,560
Event Obs.	45	45	104	104
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 34: Newsweek Green Rankings: Effect of Rank

	Dependent variable:	
	Abnormal Daily Returns	
	(1)	(2)
$0 \leq t$	0.0001	
	(0.0001)	
Rank	0.000	0.000
	(0.00000)	(0.00000)
Rank $\times$ $0 \leq t$	0.00000	
	(0.00000)	
$t = 0$		-0.0003
		(0.001)
$0 < t \leq 5$		0.001^{**}
		(0.0003)
$5 < t$		-0.00004
		(0.0002)
Rank $\times$ $t = 0$		-0.000004^{*}
		(0.00000)
Rank $\times$ $0 < t \leq 5$		0.00000
		(0.00000)
Rank $\times$ $5 < t$		0.00000
		(0.00000)
Constant	0.000	-0.000
	(0.0001)	(0.0001)
AR Obs.	320,180	320,180
Event Obs.	2,287	2,287
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 35: Newsweek Green Rankings: Change in Rank

	Dependent variable:	
	Abnormal Daily Returns	
	(1)	(2)
$0 \leq t$	0.0001^{***}	
	(0.0000)	
Change	-0.000	0.000
	(0.00000)	(0.00000)
Change $\times$ $0 \leq t$	-0.00000	
	(0.00000)	
$t = 0$		-0.0006^{*}
		(0.0003)
$0 < t \leq 5$		0.0008^{**}
		(0.0002)
$5 < t$		-0.0002^{**}
		(0.00009)
Change $\times$ $t = 0$		-0.00000
		(0.00000)
Change $\times$ $0 < t \leq 5$		-0.00000
		(0.00000)
Change $\times$ $5 < t$		0.00000
		(0.00000)
Constant	0.000	-0.000
	(0.0001)	(0.0001)
AR Obs.	228,200	228,200
Event Obs.	1,630	1,630
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 36: Carbon Disclosure Project

	Dependent variable: Abnormal Daily Returns					
	A List		Bottom Performance		Non-participation	
$0 \leq t$	−0.0003		0.0004		−0.0002	
	(0.0002)		(0.0003)		(0.0001)	
$t = 0$		−0.003***		−0.002		0.0004
		(0.001)		(0.001)		(0.001)
$0 < t \leq 5$		0.0003		0.0001		−0.001***
		(0.0004)		(0.001)		(0.0002)
$5 < t$		−0.0004		0.001*		0.0002
		(0.0003)		(0.0004)		(0.0001)
Constant	−0.000	−0.000	0.000	−0.000	0.000	0.000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.00005)	(0.00005)
AR Obs.	20,860	20,860	13,020	13,020	123,200	123,200
Event Obs.	149	149	93	93	881	881

Note: *p<0.1; **p<0.05; ***p<0.01

Table 37: Carbon Disclosure Project: Changes since prior year

	Dependent variable: Abnormal Daily Returns			
	Change in Performance Band		Change in Disclosure Score	
$0 \leq t$	−0.00002		−0.0001	
	(0.0001)		(0.0001)	
Change	−0.000	−0.000	−0.000	0.000
	(0.00003)	(0.00003)	(0.00000)	(0.00000)
Change $\times$ $0 \leq t$	0.00000		0.00001	
	(0.0001)		(0.00001)	
$t = 0$		−0.001***		−0.001***
		(0.0004)		(0.0005)
$0 < t \leq 5$		−0.00004		0.00002
		(0.0002)		(0.0002)
$5 < t$		0.0001		0.00001
		(0.0001)		(0.0001)
Change $\times$ $t = 0$		−0.0004		0.00001
		(0.0004)		(0.00004)
Change $\times$ $0 < t \leq 5$		0.00002		−0.00001
		(0.0002)		(0.00002)
Change $\times$ $5 < t$		0.00003		0.00001
		(0.0001)		(0.00001)
Constant	0.000	−0.000	0.000	0.000
	(0.00004)	(0.00004)	(0.00004)	(0.00004)
AR Obs.	153,720	153,720	153,440	153,440
Event Obs.	1,098	1,098	1,096	1,096

Note: *p<0.1; **p<0.05; ***p<0.01

Table 38: EPA Climate Leadership Awards

	Dependent variable:	
	Abnormal Daily Returns	
	(1)	(2)
$0 \leq t$	−0.0003	
	(0.001)	
$t = 0$		0.001
		(0.002)
$0 < t \leq 5$		0.001
		(0.001)
$5 < t$		−0.001
		(0.001)
Constant	0.000	−0.000
	(0.0002)	(0.0002)
AR Obs.	6,020	6,020
Event Obs.	43	43
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 39: Robeco SAM Yearbook

	Dependent variable: AR			
	Leaders		Movers	
$0 \leq t$	0.002***		−0.0001	
	(0.001)		(0.001)	
$t = 0$		0.005**		0.002
		(0.002)		(0.002)
$0 < t \leq 5$		0.001		0.0002
		(0.001)		(0.001)
$5 < t$		0.001**		−0.0003
		(0.001)		(0.001)
Constant	0.000	0.000	0.000	−0.000
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
AR Obs.	5,740	5,740	5,600	5,600
Event Obs.	41	41	40	40
Note:			*p<0.1; **p<0.05; ***p<0.01	

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